ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXIII, No. 15. CHICAGO, SATURDAY, OCTOBER 11, 1913. ISSUED WEEKLY.

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY
608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
J. B. McCarthy, Asst. Gen. Mgr. C. W. Forbrich, Asst. Bus. Mgr.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich.....Associate Editor
J. E. Latta.....Associate Editor

SUBSCRIPTIONS.

One Year, United States.....$3.00
One Year, Canada..... 4.00
One Year, Foreign Countries..... 6.00
Single Copy, 10 cents. Back numbers, beyond one month, each .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
Working for the House.....705
Improvements in the New Haven Electrification.....706
Keeping Interiors Lighted for Advertising Value.....706
Problem of the Small Central Station.....707
Using the Slogan.....707
DEPARTMENTS:
Commercial Practice.....715
Electrical Construction.....720
Dollar Wiring Kinks.....726
Public Service Commissions.....727
Questions and Answers.....728
New Electrical and Mechanical Appliances.....738
Current Electrical News.....745
Record of Electrical Patents.....751
LEADING ARTICLES:
Electricity in Canning Factories.....711
The Central Station in the Small Town.—By H. L. Titus.715
Installation of Rigid-Conduit Work In Buildings of Concrete Construction—I.—By G. N. McCarthy.....720
Colorado Electric Light, Power and Railway Association..731
The Birmingham Meeting of the British Association for the Advancement of Science.—By John B. C. Kershaw.....732
MISCELLANEOUS:
Program of Convention of American Electric Railway Association.....708
Hubert Schuurman Wynkoop.....709
Liberal Flame—Arc Lighting for Chicago.....709
New York Electric Show.....710
Program of Association of Railway Electrical Engineers..710
Electric-Vehicle Convention.....710
Users of Electric Commercial Vehicles in New York.....714
Logging by Electricity.....717
Report on Chicago Rates.....717
New Slogan Sign in Toledo.....718
New Central-Station Building at Ann Arbor.....719
New Office Building in Lexington.....719
New Albany Centennial.....719
New Officers for Electrical Workers.....724
The Passing of the Mile as a Unit of Electrical Measurement.....724
Among the Contractors.....725
New England Vehicle Section.....728
Dixon Inaugurates White Way.....735
Safety at Sea.....735
Boosting Electrics in England.....736
Rejuvenation of Philadelphia Jovians.....736
Monster Rejuvenation in St. Louis.....737
Convention of Empire State Gas and Electric Association.737

Copyright, 1913, by the Electrical Review Publishing Company.

WORKING FOR THE HOUSE.

From time to time throughout the year a great many electrical manufacturers and a number of the leading jobbers of electrical supplies hold conferences of their sales organizations so that the heads of the departments, generally located at the home office, may make personal contact with the managers of their branch houses and the men on the road. At the close of each conference, report goes out that the meeting was one of the most successful ever held by the organization, that the men report the outlook for business in their various territories especially hopeful, and that all have been inspired through a better realization of their connection with the house and the interdependence of one element upon the other.

The frequent interchange of ideas between the man on the road and the home office is of great importance. No effort should be spared upon the part of those responsible for the orderly conduct of the business and its progress as a profitable institution to impress upon its branch-office managers and its men on the road a thorough understanding of the difficulties which competitive conditions involve, and the sincere desire of those holding positions of responsibility to co-operate with and assist the man away from home to the greatest degree possible.

The necessity for a close community of interest upon the part of the salesman and the home office is nowhere better demonstrated than in the case of the salesman so thoroughly imbued with the sincerity of his house that he becomes a militant, ardent supporter of its policies and refuses to be an apologist for what his customers may think are his house's shortcomings.

When a salesman is convinced of the equity and correctness of the policy of his house he would not be disturbed at the possible loss of an order through being unable to meet some alleged reduction in price for a line of material similar to that which he is representing. If his house has properly informed him he will drive it home to the customer with force and energy that the maintaining of a decent policy and a decent price is of vital importance not only to his own organization but to the success of the customer as well.

The large majority of the buyers of electrical material appreciate quality in the goods they purchase, and are willing to pay a price commensurate with

the merit of the article. But they would be foolish indeed not to take advantage of the best bargain they can get. The price on a standard article is usually set by the house after due consideration of all the conditions involved, and the salesman representing the house can receive an adequate remuneration and feel secure in his position only as long as his house can operate on a safely profitable basis.

The salesmen handling electrical material are of as high a grade of intelligence and earnestness as the representatives in any kind of industry. The conditions of competition are as keen as those found anywhere else, and it is because of the latter condition that the intelligence referred to is highly necessary. When, therefore, the demand is made for a thousand-lot price on a broken-package order the salesman must summon forth his intelligence and stiffen his backbone with a thorough consciousness of his faith in the house. The moment he tells the customer that he would like to oblige him personally but that the house won't stand for it, he has started himself in the wrong direction and has begun a situation that will ultimately result in no benefit whatsoever to his customer. Where goods are being sold in retail quantities at wholesale prices it is not the fault of the customer. The trouble lies in the weakness of the ambassador and the salvation of a situation of this kind lies in the salesmen and the house getting together on a basis of mutual respect and entire confidence.

IMPROVEMENTS IN THE NEW HAVEN ELECTRIFICATION.

Substantial improvements in overhead construction are illustrated in the electrification of the New York, New Haven & Hartford Railroad, now under way between Stamford and New Haven, Conn., and exemplify afresh the flexibility of the single-phase system in meeting the requirements of heavy trunk-line practice. The original installation between Woodlawn and Stamford consisted of two steel cables supported by bridge structures at frequent intervals, a copper conductor or trolley wire being connected with these cables by hangers placed at regular points. Owing to the excessive wear upon the copper wire developing under the heavy traffic between Stamford and New York City it was found necessary some time ago to suspend a steel contact wire just below the copper conductor, relieving the latter of its wear and providing a far more satisfactory means of power transmission to the electric locomotive pantagraph collector.

On the new section a compound catenary construction is being installed which permits a somewhat different type of bridge structure and in some respects a more simplified method of power distribution. In the first section, the two steel cables at the top of the suspension triangle, the copper and steel wires were all energized. In the new section, only the wires below the supporting insulators will be alive.

The latest type of compound catenary consists of a main supporting cable of steel fastened to the top members of the catenary bridges with cast-iron clamps. Two intermediate cross bents are located between each pair of bridges, the bents being composed of light I-beams clamped to each of the main supporting cables. Track catenary wires are supported from these cross bents by 110,000-volt insulators, while underneath the former are suspended grooved copper wires supported at 10-foot intervals by hangers attached to the track catenary stands, grooved-steel contact wires being attached below the copper as in the original electrified section. Special care has been taken to preserve perfect alinement and the use of curved clips on curves is a feature of value. The standard bridge spacing is 100 yards, but this is somewhat reduced on curves, and as in the original section, intermediate poles are utilized in many cases between the bridges to care for the conditions imposed by changes in track alinement.

So efficient has the high-tension, single-phase system proved in the distribution of power that it will be possible to utilize the Cos Cob plant to furnish energy for the entire Stamford-New Haven section. An excellent example of this efficiency is obtained in the operation of the New York, Westchester & Boston line, which obtains its power from the Cos Cob station at the end of the New Rochelle branch, 16 miles distant, and with a loss of not over 3 per cent. When the conditions warrant, the electrification of the road will be continued to New London and Hartford, at which time a new power plant will be needed to care for the traffic. It is interesting to note that the improved mechanical construction so successful in high-voltage steel-tower transmissions of modern type is in no small degree adaptable to heavy railroad electrification at lower pressures.

KEEPING INTERIORS LIGHTED FOR ADVERTISING VALUE.

The advertising value of various forms of exterior lighting of commercial buildings is well known, as is evidenced by the many installations of outline, facade and store-front lighting. The value of liberally lighting store windows for many hours in the evening, even though the establishment itself is closed, is very generally recognized. But little attention has as yet been given, however, to keeping the interior brightly illuminated for the same reason that store windows are kept lighted.

Reasons for failure to appreciate this fully in the past are, of course, quite evident, chief among them being the former relatively high cost of lighting. Since the use of tungsten lamps has become general, however, this argument no longer has much force. Electric lighting is now very inexpensively provided even on a quite liberal scale. The cost of keeping

the lamps lighted for a few evening hours after closing is therefore not prohibitive and in the case of an enterprising business establishment can well be charged to the advertising account, since the practice of keeping lamps so lighted has undoubted advertising value for many firms and institutions.

Nothing is so depressing and conducive to lack of confidence as a gloomy store or other place of business during business or working hours. A person fears to venture in because he may be cheated by failure to see flaws in the things he would like to purchase.

For example, a poorly lighted restaurant will not inspire patronage for obvious reasons. Likewise, a store that is pitch dark after closing time gives the impression that its owners are penurious or afraid for some reason or other to let the public see what kind of establishment it really is.

On the contrary, by maintaining a bright illumination of the interior, or at least making a part visible from the street, the merchant shows that he is an enterprising, wide-awake business man who has nothing to fear from publicity and, in fact, courts inspection of his premises and his goods. Particularly when the interior, be it store, bank, real-estate office, or other business house, is finished with some consideration for architectural or artistic effect, the public should be invited to view the beauty of the interior when its design can be most impressively seen, that is, after business hours. Where the establishment is lofty and spacious that fact should become known and this is best done when there is no one within to obstruct the view.

An interesting case of this kind is the Swedish-American Bank in Chicago, whose illumination is described in another part of this issue. In this case the interest is enhanced by producing the illumination from entirely concealed light sources. This calls to mind an aspect of indirect illumination that has not been made much of. In looking into an interior from the outside, one can see farther and perceive much greater detail when that interior has no visible light sources. The effect is therefore much more impressive than when a number of lights appear in the range of vision. This is particularly true when looking up at rooms above the ground level. With indirect lighting the ceilings appear very bright and give an aspect of cheerfulness. Where direct lighting is used one is apt to see little beyond the lights themselves or the fixtures that bear them.

Another value of lighting after business hours must be mentioned. That is that it deters thieves from entering the premises. In order to achieve this additional benefit, the interior must be fairly well lighted throughout the night and every night of the week. This is already being done in many instances where a few lamps are kept burning during the entire night with excellent effect.

PROBLEMS OF THE SMALL CENTRAL STATION.

The paper read by Mr. H. L. Titus at the recent convention of the Colorado Electric Light, Power and Railway Association, which will be found on pages 715-717, presents very well some of the difficulties to be met in extending the scope of the central station in a small town, and the means of overcoming these difficulties. Many of the small towns of the country, like most of the large cities, are growing fast enough to create continual new possibilities in the acquisition of power load by the central station, but there are many others where an active new-business department will soon exhaust all the possibilities in that direction. It then becomes necessary to seek other sources of load if the usefulness of the central station is to be extended and its prosperity maintained. Mr. Titus points out the possibilities in the way of household appliances, fans and commercial devices, pumping for irrigation, and ice-making, and the perusal of his remarks on the subject should be suggestive to every central-station manager operating in a town of this class. Evidently the company with which Mr. Titus is associated has left none of these stones unturned, and the efforts in each one of these directions seems to have been worth while and resulted happily for the company.

There is one large possibility in the general field for adding load of a desirable kind, but this is not always promising in a small town. We refer to the greater use of the electric vehicle. No doubt there are, however, many towns in which sufficient business of this kind could be secured to be well worth while, and it can usually be so arranged as to place a load upon the system at a time when the generating and distributing equipment is almost idle.

The remarks of Mr. Titus with respect to joining in the civic and commercial activities of the town might well be followed by every central-station manager, with both direct and indirect benefits to the company he represents.

USING THE SLOGAN.

From among a large number of suggestions the Society for Electrical Development picked as a slogan a phrase comprising a very suggestive admonition—"Do It Electrically." An effort should be made by every one connected with the electrical industry to impress its message upon the general public. To this end the Society is supplying to its members, for use upon their stationery, electrotypes bearing the Society's emblem and this slogan.

To further this end and at the same time advertise its own business, the Toledo Railways and Light Company has erected an imposing electric sign bearing the Society slogan. A photograph of this sign is reproduced upon another page. The idea is an excellent one and might well be copied by every central station in the country.

PROGRAM OF CONVENTION OF AMERICAN ELECTRIC RAILWAY ASSOCIATION.

Papers to be Presented at the Atlantic City Meeting.

The annual convention of the American Electric Railway Association will be held at Atlantic City, N. J., October 13 to 17. As usual, in addition to the meetings of the American Association, there will also be sessions held by the American Electric Railway Engineering Association, the American Electric Railway Accountants' Association, the American Electric Railway Claims Association and the American Electric Railway Transportation and Traffic Association. Sessions of the parent association will be held in the Greek Temple at the Convention Pier, and of the Engineers in Engineers' Hall.

The first session will be held on Monday afternoon, October 13, by the Engineering Association. The engineers will hold additional sessions on Tuesday, Wednesday, Thursday and Friday morning. The first session of the American Electric Railway Association will be held on Tuesday afternoon and will be followed with sessions on Wednesday and Thursday afternoons. The accountants will meet each morning, beginning with Tuesday morning. The claim agents will hold meetings on Monday afternoon, Tuesday and Wednesday mornings. The Transportation and Traffic Association will hold meetings on Tuesday, Wednesday and Thursday mornings. There will be extensive exhibits by the Manufacturers' Association in the Exhibition Hall.

Two special trains for the convention will be arranged. One of these will leave Chicago on Sunday, October 12, at 10.35 a. m.

The other train will leave St. Louis on Saturday, October 11, at noon.

Itemized Program of Papers.

American Electric Railway Association.—Tuesday afternoon: Presidential Address and reports of committees as follows: "Subjects," by James D. Mortimer; "Membership (Company)," by Richard McCulloch; "Membership (Individual)," by John L. O'Toole; "Education," by H. H. Norris. There will be addresses on "Franchsie Values" by Frank Bergen, on "Other Elements of Value," by C. M. Rosencrantz, and on "Physical Valuation."

Wednesday afternoon: Reports of committees as follows: "Insurance," by H. J. Davies; "Public Relations," by Thomas N. McCarter; "*Aera* Advisory," by C. Loomis Allen; "Welfare of Employees," by J. J. Burleigh; "Electrolysis," by Calvert Townley; "Company Sections," by C. N. Duffy; "Gold Medal," by E. C. Foster; "Constitution and By-Laws," by C. L. Henry; "Relations with Sectional Associations," by C. L. Henry. There will also be addresses on "Publicity Work in Detroit," by A. D. B. Van Zandt; "Profit Sharing with Employees," by W. F. Ham and David W. Ross; "The Relations of Carriers to the Development of the Territory They Serve," by Paul Shoup; and "The Relief of City Congestion By the Construction of Subways and Viaducts," by C. S. Sergeant.

Thursday afternoon: Reports of committees as follows. "Compensation for Carrying United States Mail," by T. H. Tutwiler; "Taxation Matters," by C. L. S. Tingley; "Federal Relations," by Arthur W. Brady; "Joint Use of Poles," by W. J. Harvie; "Cost of Passenger Transportation Service," by James D. Mortimer. There will also be addresses on "Electric Railway Securities From The Investor's Viewpoint," by C. W. Beall, and on "Present Tendency of Public Utility Laws and Regulations," by Frank Hedley, C. L. S. Tingley and Richard McCulloch.

Engineering Association.—Monday afternoon: Presidential Address and reports of committees as follows. "Standards," by Paul Winsor; "Power Distribution," by G. W. Palmer, Jr.; "Electrolysis," by A. S. Richey.

Tuesday morning: Joint session with the Transportation and Traffic Association. There will be reports of committees as follows: "Block Signals," by J. M. Waldron; "Block Signals and Rules," by J. M. Waldron and F. A. Boutelle; "Train Operation (City)," by H. H. Adams and W. H. Sawyer; "Train Operation (Interurban)," by E. C. Faber.

Wednesday morning: Reports of Committees. "Buildings and Structures," by R. H. Pinkley; "Heavy Electric Traction," by E. R. Hill; "Power Generation," by B. F. Wood.

Thursday morning: Joint session with the Accountants' Association. Reports of committees on "Engineering Accounting," by J. H. Hanna and F. B. Lasher; on "Life of Railway Physical Property," by Martin Schreiber and R. N. Wallis; "Way Matters," by J. M. Larned.

Friday morning: Reports of committees as follows. "Equipment," by F. R. Phillips; "Education," by William Roberts. Election of officers.

Transportation and Traffic Association.—Monday afternoon: Reports of committees as follows. "Individual Membership," by L. C. Bradley; "Uniform Definitions," by M. C. Brush; "Rules (Consolidated)," by F. A. Boutelle.

Tuesday morning: Joint session with Engineering Association.

Wednesday morning: Joint session with Accountants. Reports of committees as follows: "Fares and Transfers," by F. T. Wood and M. R. Boylan; "Express and Freight Traffic," by F. D. Norviel; "Express and Freight Accounting," by J. K. Choate and Walter Shroyer; "Statistical Unit for Car Operation," by C. B. Buchanan and C. H. Lahr; "Best Methods of Collecting and Accounting for Variable Rates of Fare," by M. R. Boylan. There will also be an address on "Factors Affecting the Cost of Passenger Service," by Edwin Gruhl.

Thursday morning: Reports of committees as follows. "Construction of Schedules and Timetables," by J. E. Duffy; "Training of Transportation Employees," by C. B. Wells; "Passenger Traffic," by J. E. Gibson. There will also be an address on "Regulations on Sanitation, As Relating to Public Carriers."

Accountants' Association. — Tuesday morning: Presidential Address, and reports of committees as follows: "Education," by F. J. Pryor, Jr.; "Destruction of Records," by H. S. Swift; "Standard Classification of Accounts," by H. L. Wilson; "To Represent Association at Convention of Railway Commissioners," by W. F. Ham. There will also be a paper on "Sinking Funds," by W. H. Forse, Jr.

Wednesday morning: Joint session with the Transportation and Traffic Association.

Thursday morning: Joint session with Engineering Association.

Friday morning: Reports of committees as follows. "Interline Accounting," by L. T. Hixon; "Co-operating with the United States Bureau of the Census," by A. L. Linn, Jr.; "Overhead Charges," by P. S. Young. There will be addresses on "The Census of Electric Railways," by William M. Steuart, on "Overhead Charges," by Henry Floy; on "A Unit-Cost Work-Order System," by G. W. Kalweit; on "Accounting Department Conferences," by F. B. Lasher.

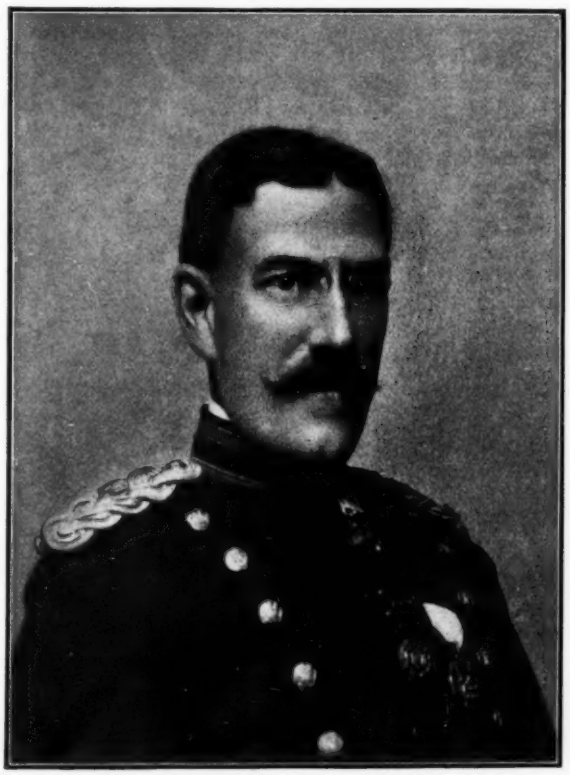
Claims Association. — Monday afternoon: Presidential address; papers on "Mechanical Devices for Preventing Accidents," by John J. Reynolds and M. P. Spillane; "The Investigation of Street Railway Accident Cases," by W. P. Christiansen.

Tuesday morning: Papers on "The Prevention of Accidents," by H. V. Drown; and on "The Value of Safety Committees," by George Carson.

Wednesday morning: Papers on "Motor Vehicles," by M. B. Bracken; and "Adjustment of Accident Claims," by F. D. Edmunds. There will also be reports of committees.

Hubert Schuurman Wynkoop.

The man who directs the electrical inspection for a metropolitan municipality occupies a position that is a unique one in the electrical industry. It is a work that requires unusual ability, tactfulness, patience and an unswerving disposition to be fair and impartial under all circumstances. The engineer who fills a place like this has the public for his employer, and the public, the central station and the isolated plant, the electrical contractor, and the manufacturer of current-consuming appliances for his clients. He must be an expert along electrical lines, and must be able at all times to see what is just and proper, without bias or partiality. A gentleman who measures up to his high standard is Hubert Schuurman Wynkoop, who, as the engineer for the electrical inspection bureau, has charge of the inspection work for New York City.



Hubert S. Wynkoop,
Electrical Engineer for Bureau of Gas and Electricity, New York City.

Born at Yonkers, N. Y., in 1866, and descended from the Hollanders who settled in the vicinity of Albany in the middle of the seventeenth century, Mr. Wynkoop was educated at Adelphi Academy, Brooklyn, and at Stevens Institute of Technology, Hoboken, N. J., at which latter institution he received the degree of mechanical engineer. He entered the electrical field in 1888 with the Leonard & Izard Company, first at Minneapolis and later at Chicago. Leaving this concern, he became assistant district engineer of the Edison General Electric Company, being located first at Chicago, then at San Francisco, and then at Atlanta. When the Thomson - Houston Company joined with the Edison General Electric Company, he remained with the new organization until 1893. In the spring of 1894 he entered the service of the city of Brooklyn as inspector of gas and electricity, and upon consolidation with the city of New York was detailed to organize an electrical inspection service for the burrough of Brooklyn, receiving shortly thereafter the title of electrical engineer, which he now holds. In 1908, when the electrical inspection bureaus of the five burroughs were consolidated, he was called over to headquarters in Manhattan and placed in charge. Having under his control a force of about one hundred persons, sixty-five of whom are inspectors, he properly set to work to perfect in an official manner, the informal plans which he and J. C. Forsyth, chief inspector for the New York Board of Fire Underwriters, had been developing for the preceding ten years, looking toward the standardization of electrical rules and interpretations. With the enormous prestige which these two men enjoyed through the importance of their positions and the hearty support of their superiors and associates, it has been possible to place the electrical inspection service in the city of New York on a very high plane.

It will be understood that Mr. Wynkoop's twenty-five years of business experience have included lighting and power installations as viewed from the standard of the designer, the erector and the critic. He is, therefore, peculiarly well equipped for the position he holds.

Mr. Wynkoop is a fellow in the American Institute of Electrical Engineers; a member of the American Society of Mechanical Engineers; a member of the Brooklyn Engineers' Club; a member of the Municipal Engineers of New York; the secretary of the Department of Electricity of the Brooklyn Institute; the vice-president of the National Association of Electrical Inspectors; an associate member of the National Fire Protection Association, and is also associated with a number of other important professional and fraternal organizations. He has taken a lively interest in military affairs and in recognition of his services here was made a major in the National Guard.

As busy a man as Mr. Wynkoop is, he is always ready to respond to any reasonable service that he can accord a friend. He is a cultured gentleman whom it is a pleasure to meet casually, and a greater pleasure to know well.

Liberal Flame-Arc Lighting for Monroe Street, Chicago.

By the co-operation of the city of Chicago with the property-owners along the downtown part of Monroe Street, that street is to be provided with a liberal equipment of flame-arc lamps installed in the same general manner as along the downtown part of Dearborn Street, which was described and illustrated in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of April 12, 1913. On September 18 the Monroe Street Improvement Association was organized with F. L. Rossback, president; L. M. Willis, vice-president; N. M. Lamport, treasurer; D. T. Tayman, secretary. The immediate object is to improve the street lighting by the installation of 74 flame-arc lamps on the eight blocks or two-third mile between Michigan Boulevard and the South Branch of the Chicago River. Other objects are the construction of a bridge over the river and adjoining railroad tracks, repavement of part of the street, etc.

Preliminary plans for the new lighting are completed and estimates will soon be secured, after which will come collection of the necessary funds and installation of the poles, cables and lamps. Herbert A. Seward, 1223 Manhattan Building, Chicago, is engineer for the Improvement Association.

The city authorities are favorably disposed toward the project and, in fact, would like to see the entire downtown district lighted in the same liberal manner, thus making it the best lighted area of about one-half square mile to be found anywhere. Agitation for similar improved lighting on several other downtown streets has already been started.

Central Heating in Boonville.

Central-station heating service is being put into effect by the Boonville (Ind.) Electric Light, Heat & Power Company. A hot-water system is to be used.

New York Electrical Show.

The New York Electrical Exposition and Motor Show of 1913 will be formally opened to the public at Grand Central Palace on October 15. A number of extraordinary and really interesting achievements have been wrought during the course of twelve months which the promoters of the 1913 exhibition have been busy arranging for the public's inspection and entertainment.

The United States Government will initiate visitors into the mysteries of money making. A fully equipped mint—a small duplicate of the great mint at Philadelphia—has been constructed and the process of coin manufacture will be shown at close range. Souvenir coins of copper alloy may be obtained as they fall from the press by visitors at the Exposition.

The United States Navy will exhibit the bridge of a battle ship in regular working order. More than $10,000 has been expended in carrying out every detail of this bridge, which contains the electric signalling devices used aboard the modern man-o'-war.

Another of the more instructive of the Government exhibits is a complete working model of the Pedro Miguel Lock, the construction of which is one of the engineering triumphs of the Panama Canal. The model is 20 feet long, complete in every detail, and shown in actual operation with water coursing through it and miniature ships being carried through the locks.

In the electric farm and dairy exhibit cows will be milked, butter churned and pressed, chickens and ducks hatched, and various pieces of farm machinery will be operated by electricity. Four white Ayreshire cows, yielding from 35 to 50 pounds of milk daily, will be milked three times per day. The milking is done by electricity. After the milk has been run through a clarifier it goes into a separator, the cream being used for making butter. The butter is prepared by a motor-driven butter worker, and after being cooled to the right temperature, is made into prints. Electricity does it all.

The incubators are equipped with an automatic switch control which regulates the heat to within one-third degree of the desired temperature. All day long during the exposition chickens and ducks will be hatching. The hatched chickens will be transferred to electric brooders and kept there until old enough to take care of themselves. The young ducks have been provided with a pond.

Large models of the new nitrogen-filled lamp will be exhibited. The new lamp is a tungsten lamp of high efficiency with the lamp filaments in nitrogen gas instead of in vacuum. The first nitrogen lamps which will be put on the market will be large units suitable for outdoor illumination. The new lamp gives light whiter than the ordinary tungsten and comes nearer daylight than any other commercial form.

The new lamps at Grand Central Palace are rated at 5,000 candlepower, and are suspended from the four corners of the big central wall. These lights will be turned on for five minutes at stated intervals every day. This scheme has been adopted lest the blaze dazzle the eyes of beholders, making it impossible for them to see anything else.

Program of Association of Railway Electrical Engineers' Convention.

The following tentative program has been announced for the forthcoming annual convention of the Association of Railway Electrical Engineers which will be held in Chicago, October 21 to 24, inclusive.

Tuesday morning session: Address of President; Report of Secretary-Treasurer; report of Committee on Standard Reports for Operation.

Afternoon session: Reports of the Committee on Terminal Facilities for Handling Car Lighting Equipment; Committee on Head End Equipment; Committee on Electric Headlights.

Wednesday morning session: Reports of committees on Methods of Charging Storage Batteries; on Standards, with the subcommittee reports on Dynamo Suspension; Adoption of Standard Car Lighting Reports by M. C. B.; Lamp Specifications; paper on Incandescent Lamps, by Preston S. Millar.

Afternoon session: Reports of committees on Wire and Cable Specifications; on Installation of Wiring for Electric Light and Power in Railway Buildings; and on Outside Construction and Yard Lighting.

Thursday morning session: Reports of committees on Illumination; and on Shop Practice. The afternoon session will be devoted to members of the Railway Electric Supply Manufacturers' Association who wish to bring before the members of the A. R. E. E. any new devices or improvements in their apparatus. The following papers will also be presented: Gas Electric Truck, by a member of the General Electric Company; New Axle Equipment, by J. Lester Woodbridge; Electric Truck for Handling Freight, by T. V. Buckwalter.

Friday morning session: Report of the Committee on Data and Information and Question Box; Report of Auditing Committee.

Electric-Vehicle Convention.

The fourth annual convention of the Electric Vehicle Association of America will be held at the Hotel LaSalle, Chicago, October 27-28. This hotel is admirably suited for convention purposes, the necessary meeting rooms, registration bureau, and exhibition rooms being so arranged that all of the business of the convention can be conveniently handled within a reasonably small compass.

The registration office and the business office of the Association will be on the eighteenth floor of the Hotel and on this floor will be 30 or 40 rooms devoted to exhibits of manufacturers of electric vehicles and accessories. The business sessions will be in a large room on the nineteenth floor.

The program is made up of eleven papers on the various phases of the electric-vehicle industry, prepared by men well known in their respective lines; in addition to which there will be the address of the President and reports of the various committees. These sessions will be held both morning and afternoon of Monday and Tuesday. The titles of these papers were given last week.

The entertainment features to be provided by the Convention Committee include a beefsteak dinner to be given to members and invited guests at the Hotel LaSalle Monday evening at 6 p. m., after which the members and guests will be taken in electric automobiles through the parks and boulevards to visit two or three of the up-to-date electric garages, this trip being made at a time of the day when most of the cars will be in and an opportunity will be given to see the cars, the charging devices and the manner of caring for a large number of electric vehicles in modern garages. The trip will terminate at the Hotel LaSalle, where a supper and vaudeville entertainment and smoker will be given, to which all members and guests are invited.

On Tuesday the Commonwealth Edison Company will entertain the members and guests at luncheon at the Hotel LaSalle.

Transportation arrangements are in the hands of F. N. Carle for points east of Chicago, and C. B. Frayer for points west of Chicago.

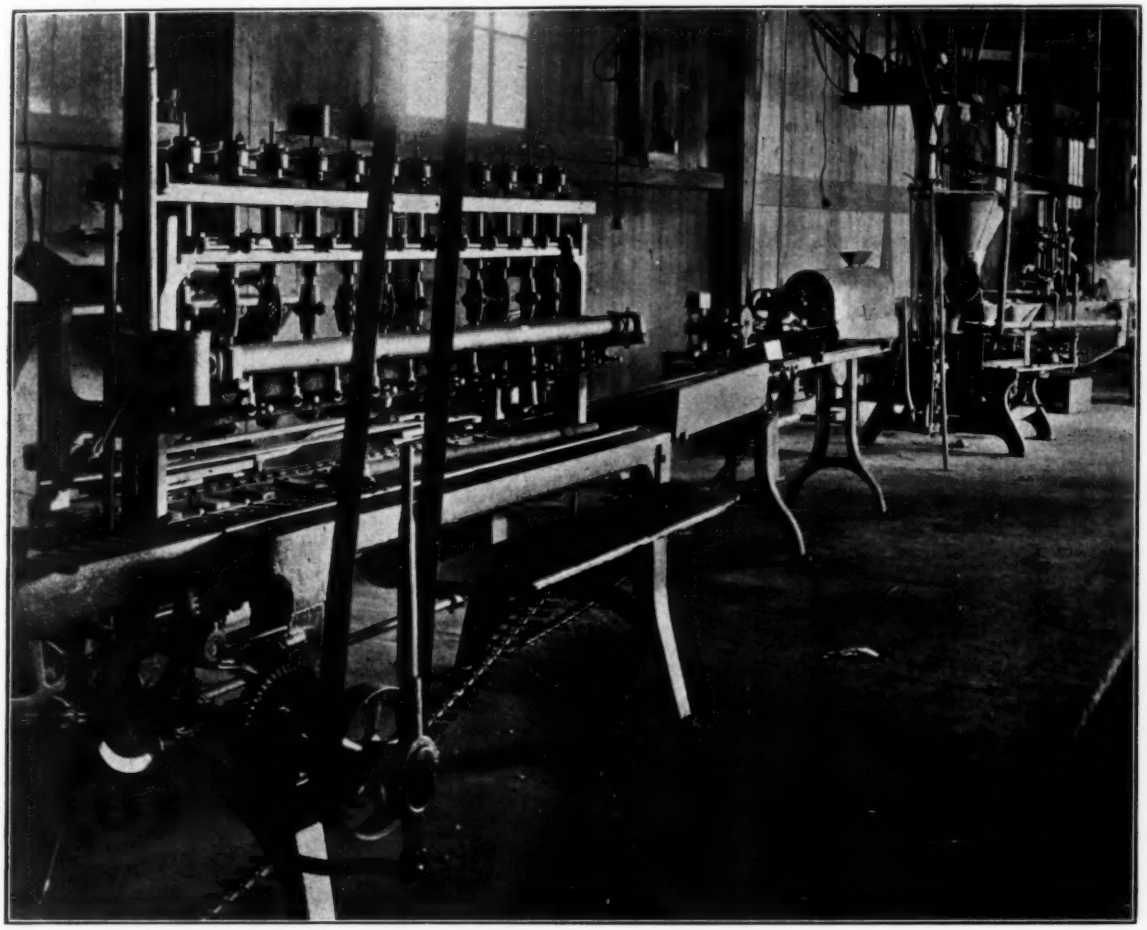
In order to provide representation for the sections among the directors of the Association, an amendment has been proposed to the constitution, providing for three vice-presidents instead of one.

The amendment is to Section 1, Article 5, and reads as follows: "The officers of the Association shall be a president, three vice-presidents, a secretary and a treasurer. The offices of the secretary and treasurer may be filled by one person. The officers shall be elected from the members in good standing at the annual meeting to be held on the second Tuesday of October in each year. Election shall be by ballot."

Electricity in Canning Factories.

Although the items of cleanliness, flexibility, and reduced investment are of sufficient importance to justify the adoption of central-station service for canning factories there are numerous other advantages and economies that make electric drive superior to other methods, in spite of the steam requirements.

Although the canning season is of short duration it comes at a time when the load of the central station is lowest and consequently is profitable business, occasionally meaning 24-hour operation for several weeks. Considered from the standpoint of the manufacturer central-station service provides a means for obtaining increased production over a steam-operated plant, without additional machines or labor, maximum cleanliness and minimum investment in plant. This latter item is of particular importance due to the short time that the equipment operates. Obviously a manufacturer could not be expected to invest large amounts of money in an efficient steam plant that operates at a maximum 12 weeks each year. The result has been that central-station service has demonstrated in a great many cases that appreciable savings can be effected by equipping for motor drive and purchasing power, rather than operating a cheaply built steam plant with its attendant losses and annoyances.

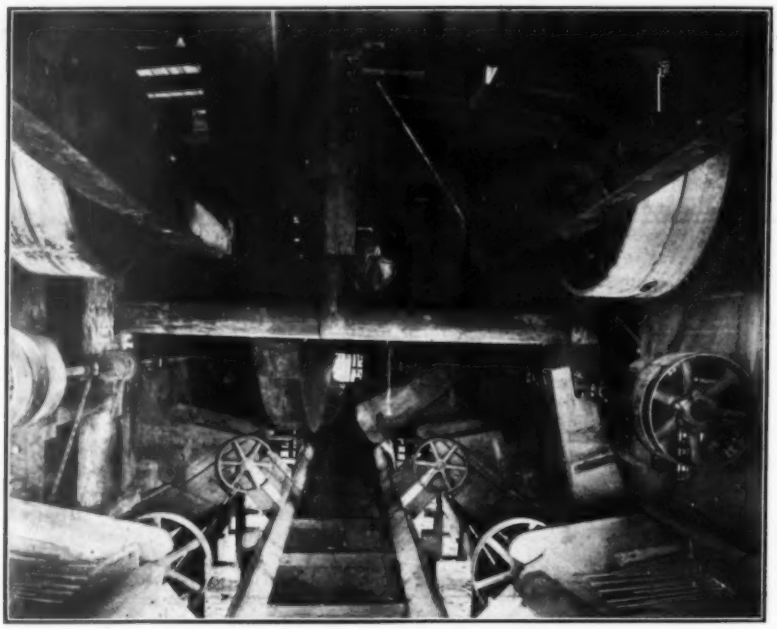


Group of Motor-Driven Pea-Canning Machines.

In soliciting the adoption of electric drive for canning factories a great proportion of success depends upon the attitude on the part of the central-station power solicitor to correctly analyze existing plant-operating expenses and fixed charges. Ability to do this readily and correctly will go far to demonstrate definitely and convincingly to a prospect the flaws and waste and general field for improvement in his power layout.

Canning factories require a considerable amount of steam, and, for this reason, in determining the relative merits and economies of various systems of drive, it is often argued that the additional coal for sustaining sufficient boiler pressure to operate the engine is negligible when compared with the fuel needed to obtain steam for cookers, etc.; therefore the engine is considered to perform functions of a cheap and effective reducing valve between boiler and heating systems, practically generating at no cost the mechanical power required.

This contention may have value in those rather rare instances of model plant where the mechanical drive has been installed to show maximum efficiency, live-steam piping tight and well lagged, the exhaust carried with a minimum of back pressure to proper heaters and cookers as well as providing steam for those machines which permit a satisfactory operation at very low pressure—in short, in installations where all the engineering niceties and refinements have been carefully introduced, it might be doubtful if the change over to elec-



Double Row of Pea-Vine Separators in Canning Factory.

tric drive, with steam for heating and cooking alone, could be made to show an appreciable saving, judged exclusively from the standpoint of the coal pile.

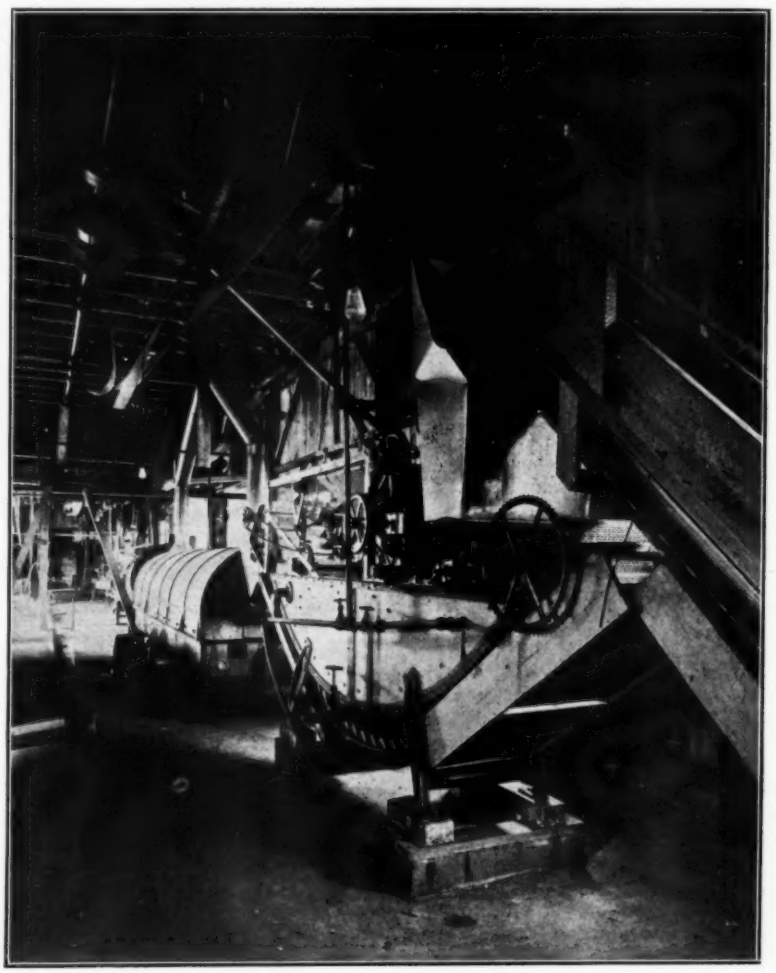
However, after considering that the average small plant labors against serious wastes in boiler and engine room (incident to careless firing; leaky pipes and valves; wear an tear; decrease in production due to slippage of belts; danger of same to woman operators; friction losses and bearing troubles accompanying long lines of shafting; dependence for continuous operation on one prime mover, and the greater time required for repairs should this single source of power fail) it is to be questioned whether the coal-pile argument may not be justly relegated to a position of minor importance.

The flexibility of motor drive is of considerable importance in canning factories. Peas, corn, tomatoes, beans, etc., usually are canned at different seasons and one installation of motors can be adapted to operate the different sets of machine employed. All that it is necessary to do it to disconnect the motors from one set of canning machines, move them to the new location and connect to the machines to be driven. Motor platforms and wiring are usually in place and the complete change over from one set of machines to an entirely different set is sometimes done in two or three hours.

If a steam plant was used either an excessive amount of power consuming belts and shafting would have to be used to operate the various sets of machines, or when through canning one variety, all the machines would have to be dissembled and a complete new equipment installed. This latter course is obviously not feasible so that in the few plants where mechanical drive is still used the power losses in transmitting energy over long distances is equal to and sometimes exceeds the power required by the machines themselves.

In plants devoted exclusively to one product this feature does not enter but the advantage of flexibility is nevertheless apparent. Motor-driven machines can be placed in a factory without any regard to line shafts, etc. This permits of locating machines with reference to the sequence of operations as the only consideration, which saves time, reduces the number of employees to a minimum and eliminates considerable handling of the product.

One of the most important advantages of electric motor drive, as applied to canning factories, is the fact that power costs are proportional to the productive work done by the driven machines. In many small plants the operation is dependent upon the supply of vegetables from the neighboring farmers, who deliver their output to the factory. This delivery, especially at the beginning or



Pea Blancher and Washer.

Canning Factory Data.

The term load-factor is used in these data in sucha sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Canning factory handling tomatoes exclusively. There are 150 girls and 15 men employed working 10 hours per day. The total operating time this year was 12 weeks. The average daily output, 36,000 cans.

Total connected horsepower, 65. Total number of motors installed, 8. Average kilowatt-hours per month, 12,622.

Kilowatt-hour consumption for four months: July, 12,160; August, 14,656; September, 14,363; October, 9,312 (part of month).

Load-factor 36 per cent; operating-time load-factor, 74 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is 220 volts, direct current.

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,200	Belted direct to a Geyser tomato washer.
1	2.5	1,400	Belted to a short line shaft driving one 50-foot belt conveyor; and one Monitor scalding machine.
1	1.5	1,200	Belted to shafting driving one 50-foot belt conveyor.
1	40	600	Belted to line shafting driving three belt conveyors, 26-inch belt, each 54 feet long; three chain conveyors, each 54 feet long; and one 50-foot belt conveyor, 26-inch belt.
1	5	1,200	Belted direct to a Cyclone pulp machine.
2	0.5	900	Each belted direct to a can capping machine.
1	5	1,200	Belted to a short line shaft driving two King filling machines; and two toppers and can wipers.

Michigan Refining & Preserving Company, Menominee, Mich. This plant cans peas, beans, tomatoes, etc. The season averages 12 weeks per year. During the month of September plant operates 24 hours a day. There is a 20-horsepower engine installed in addition to the motors.

Total connected horsepower, 42.5. Total number of motors installed, 5. Average kilowatt-hours per month, 944.

Kilowatt-hour consumption for five months: July, 530; August, 1,010; September, 1,430; October, 760; November, 990.

Load-factor, 4 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase 60 cycles, 440 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,200	Belted to line shaft driving one 40-foot 6-section Scott rotary pea separator; and one Sprague sanitary pea conveyor.
1	5	1,200	Belted to a line shaft driving conveyor in cooling-tank trough.
1	5	1,800	Belted direct to one can conveyor.
1	7.5	1,800	Belted to line shaft driving one No. 5 Monitor string-bean grader; and one string-bean cutter.
1	20	1,200	Belted to a line shaft driving one briner; two sanitary can-cleaning machines; one Hawkins capper; and one conveyor.

Canning factory located in northern Illinois canning peas and corn.

Total connected horsepower, 145. Total number of motors installed, 6. Average kilowatt-hours per month, 21,800.

Kilowatt-hour consumption for five months: June 13,720; July, 23,470; August, 25,330; September, 25,070; October, 13,660.

Load-factor, 31 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	15	900	Belted to a line shaft driving two thistle machines; two pea blanchers; two washing machines; two picking tables; two pea filling machines; two wipers; and two cappers.
1	30	900	Belted to line shafting driving two grading machines; two bucket elevators, 60 feet high; and two clipping machines.
1	35	900	Belted to a line shaft driving four pea-vine separators.
1	50	900	Belted to a line shaft driving four pea-vine separators; and one 125-foot bucket elevator.
1	5	1,140	Direct-connected to a Hawkins hoist for handling can cages.
1	10	1,200	Belted direct to deep-well pump.

close of the season, is more or less spasmodic, and the canning factory must be in a position to handle the goods as it comes in. Frequently just a few machines are needed to handle the available supply and if steam drive is in use the entire plant must be operated while with motor drive, only the particular machines need be run. Also, at the close of the season, conveyors labeling machines, nailing machines, etc., are operated in the shipping department. The additional expense of operating the entire plant so that these few machines can be used is readily apparent.

Little need be said concerning the cleanliness of motor drive as this advantage is universally recognized, especially in plants manufactuirng or handling food products. No system of overhead belting and shafting can be entirely free from dirt and oil and in this age of sanitary manufacturing methods the risk of contaminating the product by dust or grease dropping into it should not be assumed by manufacturers.

The processes involved in canning vegetables are somewhat similar, regardless of the kind of vegetable handled. In canning tomatoes the proportion of hand work to machine work is considerably greater than in canning other vegetables. In any case however, the amount of power required by the individual machines is comparatively small.

The selection of the proper motor for use in canning factory service offers no particular difficulties. Where alternating-current supply is available, the polyphase induction motor with squirrel-cage rotor will be found entirely suitable. Induction motors should preferably be wound for moderate rather than slow speed, since in addition to the decreased size and cost, the power-factor and efficiency of the moderate-speed motor is better than that of the slow-speed type.

A description of a typical tomato-canning plant located in Southern Indiana will illustrate the conditions to be met in plants of this character. This plant has just closed for the season, having operated continuously for 12 weeks during which time the output averaged 36,000 cans per day of 10 hours. There are about 150 girls and 15 men employed. The management has taken full advantage of the flexibility of motor drive and has arranged the various machines so that the sequence of operations is uninterrupted and a minimum amount of handling necessary.

All tomatoes are received in crates on a receiving platform which connects directly with the system of cleaning machinery installed in this plant. Tomatoes are dumped by hand from the crates into a "Geyser" washer of Wescott manufacture. This is simply a conveyor which carries the product through several tanks of water and discharges on to another conveyor which conveys the tomatoes through a scalding tank. A 10-horsepower motor drives the washing machine but this is considerably larger than is necessary. The motor operates at 1,200 revolutions per minute and is belt connected. A 2.5-horsepower motor running at a speed of 1,400 revolutions per minute is belted to a line shaft driving the monitor scalder and also a 24-inch belt conveyor 80 feet long. Tomatoes from the scalder are emptied into pails which are placed on this conveyor and carried into the peeling room.

There are three long double peeling tables in the peeling room at which the girls sit in preparing the tomatoes for canning. A belt conveyor runs over the center of each table for moving the pails of tomatoes from the scalder conveyor to the peelers and for carrying the peeled tomatoes to the fillers. A chain conveyor is below each table for carrying the skins to the sewer. The skins are dropped into chutes at each station which empty into this conveyor. The three belt conveyors in the peeling room run at right angles to the conveyor leading from the scalding machine and the pails from the latter must be placed on the table conveyor by hand. A 40-horsepower motor running at 600 revolutions per minute drives the three peeling table conveyors, each of which is 54 feet long, and also a cross belt conveyor, 50 feet long, which transports the pails of peeled tomatoes from the three table conveyors to the filling machines.

There are two King filling machines employed, both driven by a five-horsepower motor, running at a speed of 1,200 revolutions per minute, which also drives two can toppers and wipers.

As fast as the filled cans are discharged from the wipers they are conveyed to the capping machines, a short distance away. These machines, two in number, which place the top on the can and solder it are each driven by a 0.5-horsepower motor running at 900 revolutions per minute.

From these machines the cans are placed in wire cages and carried on trucks to the steam cookers. They are then stacked in the store room and finally labeled and packed.

Two 80-horsepower boilers are installed for supplying steam, at 80 pounds pressure, to the cookers and also for furnishing steam and hot water used in the washing processes.

In addition to the machinery already mentioned there is installed in this plant a Cyclone pulp machine which prepares tomato pulp for catsup. This machine operates intermittently and is driven by a five-horsepower motor running at a speed of 1,200 revolutions per minute.

Additional data on canning factories will be found in the accompanying sheet.

Users of Electric Commercial Vehicles in New York.

The Automobile Bureau of the New York Edison Company has recently prepared a classified list of electric commercial vehicle owners in New York City, showing the number of users and the number of cars in each line in which electrics are employed. The list, published in *The Edison Weekly*, shows 74 different businesses using electrics.

CLASSIFICATION OF ELECTRIC VEHICLE USERS IN NEW YORK CITY.

	Number of Users.	Number of Cars.
Brewers	19	322
Department Stores	17	262
Express Companies	7	197
Bakers	8	154
Central Stations	2	127
Banks	2	2
Bill Posters	1	1
Bottlers—Distilled and Spring Water	4	4
Butter and Eggs	4	11
Carpets and Household Goods	1	4
China, Glassware, etc.	2	2
Cloaks and Dresses	2	2
Clothiers	1	2
Coal	3	6
Confectioners—Wholesale	4	11
Contractors	1	8
Cordage	1	2
Drafting Instruments, etc.	1	2
Dry Goods, Silks, etc.—Wholesale	10	35
Drugs—Wholesale	1	1
Dyeing and Cleaning	2	2
Electric Garages	4	4
Electric-Vehicle Manufacturers and Agents	14	26
Electrical Fixtures and Supplies	5	6
Florists	3	3
Furriers	3	4
Gas Companies	5	17
General Delivery	5	68
Grocers—Wholesale	7	14
Hardware and Plumbers' Supplies	4	10
Hospitals	9	14
Importers	4	7
Jewelers, Silversmiths, etc.	5	44
Laces, Embroideries, etc.	1	2
Leather, Skins, etc.	1	1
Libraries	1	2
Liquor Dealers	8	13
Lumber	2	6
Markets—Retail	2	2
Meats—Wholesale	8	64
Metal Lath, etc.	1	1
Meters	1	3
Milk, Dairy Products, etc.	4	5
Millinery	5	7
Miscellaneous	12	14
Museums	2	2
Newspapers	1	1
Organs, Pianos, etc.	3	13
Paints	1	1
Paper	2	2
Police Department	1	1
Printing, Engraving, etc.	6	7
Printers' Supplies	2	2
Provisions—Wholesale	7	18
Railroads and Street Railways	3	18
Restaurants	2	5
Rubber Goods	1	1
Rubber Tires	2	3
Safes, Machinery, etc.	3	4
Shirt Manufacturers	1	1
Shoes—Retail	1	1
Shoes—Wholesale	1	3
Sight Seeing	2	11
Stationers	1	3
Storage Warehouses	7	18
Tailors	1	1
Telephone Company	1	4
Theaters, Opera Houses	2	2
Tobacconists	1	4
Trucking and Contracting	1	1
Trunks and Umbrellas	1	1
Undertakers' Supplies	4	4
Wagon Builders	1	1
Woodworking	3	3
Wood Yard	1	1
Yeast	1	22

An American consul at Leghorn, Italy, reports that while electrical heating and cooking appliances are still looked upon there as a luxury, their sale is rapidly increasing.

Commercial Practice
Management, Rates, New Business

THE CENTRAL STATION IN THE SMALL TOWN.[1]

By H. L. Titus.[2]

In central-station operation in small towns, and by small towns I refer to those of 5,000 population and less, the first problem that confronts the operator, is the organization of his service: the consumer in the small town has a right to expect just as good service as his fellow in the larger cities, and it is a fact to the credit of the small operator that he generally gets it. The next problem is the organization of his plant. A great deal of time could be taken for the discussion of a point in the economical production of a kilowatt-hour of electricity, beyond which the small plant may not go. No doubt every central-station man would like to have his full quota of instruments and test sets, which would undoubtedly give him a much more intelligent knowledge of the detail of his plant cost; no one questions the value of the different economizers, and labor and time-saving devices. But the practical management must realize just where the investment in these accessories ceases to earn an interest on the investment and becomes a burden.

But we will take it for granted that this point has been reached, the plant working at its highest practical economy, and the attention of the operator directed to other fields. He is immediately struck with that ever-present burden, the day load; and here is presented the present problem. In the evolution of our industry, we cannot but realize that more and more attention must be given it, not only to make it self-supporting, but with the realization that within the next few years, this power service must become the main earning factor of the business.

The advent of the high-economy lamp with its improved accompanying reflectors, and it is only a question of time before the tungsten lamp will be marketed with a rating of one-half watt per candle, cannot be viewed by the operator without a realization that some preparation must be made to care for the radical change in conditions necessarily brought about. And the only avenue through which he may hope to meet these changed conditions is by the upbuilding of his power load. Here the small operator is at a serious disadvantage with his larger neighbor with his well organized corps of technical men and salesmen, capable of handling every proposition within reach. The manager of the small plant must be his own engineer and his own salesman. Besides this, he must be able, and ready, to take hold of any and all parts of the work, from relining a furnace wall to scraping a bearing, and from replacing a primary fuse on a stormy night to talking the city council into giving him the contract for a few more street lamps. And among various other things he must find time to entertain traveling men; conciliate disgruntled customers; figure out an efficient outfit for a tomb-stone cutter; help the bookkeeper with the office work, be a good fellow and build up his day load.

It isn't a hard thing to get the power load of a town, and he would be a weak member indeed who could not prove the advantages of his electric drive over any other; but you will find in a small town that before long you have reached your limit; you have all the motor drive there is to be gotten, and still the returns from the day load barely pay your operating expenses. The proposition is then, to create a demand that will not only do this, but much more than this, because you will have to learn that by it you are to earn your stockholders' dividends, which, by the way, is the only means by which you can retain your popularity.

This may be done in several ways; first, through the installation of electrical appliances in the household; second, by the introduction of fans and the sale of other commercial devices; third, by working out a proposition on pumping plants, if the central station be located in a suitable territory; fourth, by the addition to the plant of an artificial ice-making machine; fifth, by an active participation in the affairs of the local Commercial Club, and an apparently disinterested effort to secure for your town new industries that incidentally will use power; sixth, by making a sincere effort to give your company the reputation of pursuing a liberal, broad-minded, public-spirited policy, which will earn friends: ever bearing in mind the elusive kilowatt-hour.

The introduction of household appliances, electric irons, toaster-stoves, grids, ovens, ranges, etc., is fast becoming one of the most important features of our industry. Since the time, not so very far distant, when the iron and other devices became commercially possible, the attention paid them by the manager of the small central station has been rather desultory. They have been considered as an attractive adjunct to the power load, principally because, while not consuming any large amount of power, they earned a high rate per kilowatt-hour, but I do not believe that on the whole, and as a small instance in the multiplicity of his duties, that they have been given the consideration they deserve. The first proposition is, that there is a large investment in residence pole-line and service equipment; the second proposition is, that through the modern high-efficiency lamp the average revenue from that investment has been cut down, notwithstanding assurance from the lamp manufacturers that it would not be; the third proposition is, that this revenue is quite likely to be still further decreased; the fourth proposition is, that the introduction of cooking and heating apparatus must necessarily be limited on the usual lighting rate for current; the fifth proposition is, that if we are to earn a living revenue from our residence consumers who are enjoying the benefit of the high-efficiency lamp, we will have to sell them "Household Power" at a low rate; the sixth proposition is that in order to sell this service, the investment in that residence section will have to be increased, because the transformer and line capacity ample for the lighting load will not be heavy enough to care for a power load in the same section; the seventh proposition is, what shall that power rate be, and how shall the business be handled? The first six are self-evident conditions, the last a problem each central station will have to solve for itself, depending on local conditions: and it is not in the province of this paper to consider its discussion.

The writer does not feel that his experience has been broad enough to qualify him to advise, but perhaps the results we have obtained in our own plant may be of assistance to others in considering the development of this business. Realizing that the successful introduction of electrical appliances in the household could only be accomplished through con-

1 Paper read at convention of Colorado Electric Light, Power and Railway Association, Glenwood Springs, September 25-27.

2 General manager of the Sterling Consolidated Light & Power Company, Sterling, Colo.

sistent educational advertising followed up by the free-trial scheme combined with personal work, we set aside a liberal allowance for this missionary work, and have kept hammering away, with very gratifying results.

With 451 residence connections, we have placed approximately 390 irons, 192 toaster-stoves, about 100 toasters and 42 heating pads; and in addition to these the usual proportion of cookers, washing machines and vacuum-cleaners. These of course, all take the regular lighting rate; then we have installed 14 private pumping plants of sufficient capacity to care for the lamps, etc., which pay us from $1.50 to $4.50 per month on an 8-cent rate. This year we have attempted to introduce the electric range and the hot plate; and have now installed and in successful operation 24 of these units. Our rates on this class of service are four cents on ranges with a minimum of $1.50 per month; five cents on the hot plates with a minimum of $1.00 per month; and we find with these rates that the operating cost does not become excessive, ranging from $2.00 per month on the hot plates as high as $7.50 per month on the larger ranges. A very close basis for estimating costs to a prospective range customer is one kilowatt-hour per day for each adult person in the household and about half this on the hot plates. I ought to say that we have taken back two installations that were placed on 30 days' trial; the others have all proven satisfactory and we anticipate a large increase in this field next season.

An installation of this kind, in nearly every case, requires a change in service wires, sometimes in secondaries and transformers, and should be made with careful consideration, not only for the purpose of getting a satisfactory voltage to your buyer, but with a view to the character of the neighborhood and possible future installations. With only the normal rate of increase in the number of service connections in the past two years, we have increased our revenue in the residence sections in the off-peak months about 22 per cent due almost entirely to this campaign. It certainly behooves us to give this business more serious consideration than we have in the past, as it is already becoming a vital factor in the conduct of our business. Let us pay more personal attention to the introduction and the sale of cooking and heating apparatus, with the realization that we are laying foundations for what a few now believe will become the principal earning factor of the industry in time to come.

The second avenue of obtaining an increase in your power load is by the introduction of fans and the sale of other commercial devices in business houses. You will note the distinction employed; a good introduction of fans is all that is practically necessary, after that they will sell themselves for all purposes and at all times of the year. On the other hand, commercial devices have to be actually sold and although this is one of the less important branches of the business, one will be surprised to find the many odd corners in which they can be placed; drink mixers for the soda fountains, dental motors, sterilizers and vulcanizers for the dentist; sterilizers for the surgeon; static-machine motors, air compressors and hot-water heaters for the doctors; and, by the way, give them a commission on all the heating pads they sell for you; sealing-wax heaters for the banks, cigar lighters for the drug stores; pancake griddles and heating elements for the coffee urns for the restaurants, gooses for the tailors and six-pounders for the milliner, and a hundred and one other ways in which to dispose of your commodity, none of which consume enough current to justify spending any great amount of time upon, but any one of which will create in its user's mind a favorable acquaintance with that hitherto mysterious electric current, and will make a booster for you in innumerable ways; and there are many idle minutes spent in the drug store, in the bank, perhaps in the millinery store, that can well be utilized toward the sale of these appliances. And there is a certain field, somewhat limited in the smaller cities, for the sale of electric vehicles; we have a few of them on our lines, and find them a very profitable source of revenue.

The problem of developing a pumping-plant territory is one meriting a large share of attention, not only on account of the extreme desirability of the load, but in the manner in which it should be handled.

First the territory most likely to increase its own load must be determined, then the cost of the line to serve this territory and the minimum sum to be returned from the investment. In coming to a decision in regard to the territory likely to become most productive, I know of no better way than to make a personal canvass of the country, talking the proposition over in a general way; and as far as possible getting an idea of individual conditions as to the cost and what the average return per acre has been, whether or not the farmer was satisfied with his existing water rights, how far it was to water under his land, how much of a water-bearing stratum he had; every little item of seemingly no importance will prove of assistance, not only in determining the field of your first efforts, but also in talking to your prospective customer in that field. After a thorough canvass has been made of the territory, it will be a question to be solved by the aid of a pencil and the county map.

In talking to a farmer he will raise innumerable questions: the effect of well water on growing crops, the first cost of the plant proposed, how much it will cost him to run it per day of ten hours, how much land he can irrigate in a day, how much water he will get from it, how long a contract you will give him, what kind of a guarantee goes with the plant, etc. For all of these questions you must have a ready answer, and a language intelligible; talk to him in horsepower and second-feet, and cost per acre-foot; don't talk above him, talk with him.

Having determined the minimum return you must have from your investment, just how to secure it becomes a question that admits of considerable argument. It has been general practice in the past to adopt a certain fixed charge per connected horsepower, allowing absolutely no deviation therefrom: but whether this is good business when you come to dealing with a farmer, who by the way is not an electrical engineer nor a financeer and knows nothing of overhead charges, is a question.

From personal experience, we have found that we can obtain practically the same results by going a little around the bush. We have found that it is rather a difficult proposition to explain to the average farmer just why he must pay $10 per month for his 10-horsepower motor whether he uses it or not, and in addition to that a certain rate per kilowatt-hour for all the current he uses. In most cases you will find that you have either gained him, but as a dissatisfied customer, or he has bought a gas engine on which he pays no fixed charge, and you lose him altogether. So we beg to offer our suggestion for what it may be worth, In the first place bear in mind that this is almost an ideal load, that can easily be kept off the lighting period by contract, and that never encroaches upon either the spring or fall peak.

For the sake of argument we will assume the cost of the line to be $750 per mile, and that the initial cost must be returned in gross receipts therefrom in three years' time, or that the minimum gross earning must be at the rate of 33 per cent. It is reasonable to suppose that at least two plants can be secured per mile of line that will care for at least 320 acres. This will mean that those 320 acres should guarantee a minimum return on the investment of $250 per year. We have made 14 contracts this year based on a minimum charge of 75 cents per acre of irrigable land, with a flat rate of four cents per kilowatt-hour. In the above case the return would be $240 per annum minimum, or a minimum earning of 32 per cent, a proper proportion of which can be charged off to fixed charge in your own office if you so desire. Some seasons the minimum would be all that

would be returned from the investment. In an ordinary year, when the usual amount of irrigating was done, the return would be approximately $450, this being based on a four-cent rate and a 16-foot lift, and our return this year has averaged $1.40 per acre.

With a fixed charge of $20 per month on two plants of 10-horsepower each, for six months, and a three-cent rate the probable return in an average year would be $456, or $6.00 more than by the first plan. But in a year of heavy rainfall, when little or no irrigation is done, not much more than the fixed charge of $120 can be realized.

So that from a financial standpoint, it appears that our plan will return a much more satisfactory income upon the investment; and here let me say that a Dutch farmer can understand the necessity of a guaranteed minimum return from an investment and is willing to make such a guarantee; and we have today 14 satisfied farmer customers, all friendly boosters, and excellent prospects for about 20 more for next season; and in the early promotion of the pumping game when we talked fixed charge per connected horsepower, we met with very little encouragement.

The load is almost ideal for the small plant, and can be secured with more or less promotion work; and once convince the farmer that you are giving him a square deal, and one that he can understand, and that you are not the arbitrary, stiff-necked corporation he has been brought up to believe is the oppressor of freedom, and you have made a friend; and by an occasional visit to his place when his crops are maturing and he can see the results of the deal he made with you, you can secure the best promoter you could possibly have, and that branch of your business will be bound to develop itself rapidly.

Artificial ice-making in connection with the electric light plant is too large a subject to be handled in this paper; it should be given the attention it deserves in a paper devoted exclusively to its interests. If there is a large enough territory surrounding, and a good field for the sale of artificial ice at home, there can be no question as to its paying a good return on the investment. Suffice it to say that we have operated a ten-ton plant for the past four seasons, and that it has earned better than 33 per cent on the investment each year, without much appreciable increase over the cost of operation of the light plant. We will be glad to furnish member companies with all the data we have in this connection.

But there are central stations so situated that it is impossible to secure a pumping load, and in a territory where it does not seem advisable to install an ice-plant, and the outlook for any additional day load seems limited. There is one line along which they and every central-station man ought to work, and particularly in small towns, and it is one that is neglected to a large extent; and that is, through the commercial clubs. From the very prominence of your industry, you can with very little effort, make yourself an important part of your commercial body, and once there an unlimited amount of good can be done for the town and yourself.

In the first place you are backed by what ought to be the strongest organization in your city; if it isn't, make it so; and then it needs only the right kind of suggestion that your town needs a flour mill, a canning factory, a creamery and cheese factory, a broom factory, an elevator, and your commercial club is instantly at work in the town's behalf, and yours.

All you need is an opportunity to figure on that 50-horsepower drive, and they will give it to you if it is in their power and if they don't realize they are doing it.

Spend some money and more time among your business men, organize weekly luncheons, and automobile booster trips, and street-lighting improvement districts; toot the town's horn—and your own with it. Be a real live wire, never too tired to at least assume an interest when a scheme is broached, no matter what it may be, a sugar factory or a baby hospital, you'll get some business out of it; don't be too bashful to have your own name as well as your company's in the daily paper; perhaps if you get next to the editor, he will after the proper kind of suggestion, ask you to write a series of articles on a new lighting scheme for the town, or the development of the farming district by electric pumping.

Attend at least one city council meeting each month, get acquainted with them and make friends of its members; donate the light for the band concerts and the fall festivals and—don't fail to have mention made in the papers of your liberality.

There is a future for the small plant, but there are four things that must be observed; seize your opportunities, create new ones, be absolutely square in your contracts, and keep everlastingly at it.

Report on Chicago Rates.

E. W. Bemis has submitted to the Chicago Council Committee on Gas, Oil and Electric Light a review of the report of City Electrician Palmer on the rates of the Commonwealth Edison Company. Mr. Bemis considers the value placed on the property by Mr. Palmer to be $5,000,000 too high. He recommends a decrease of $636,000 in the company's annual revenue.

Logging by Electricity.

Some interesting data on logging by electricity were given by E. J. Barry in a paper presented recently before the American Institute of Electrical Engineers at Vancouver. Tests were made by the author on two electric logging engines in the service of the Potlatch Lumber Company of Elk River, Idaho.

The logging engines were especially designed and built for electric drive, for use with what is known as the Mc Farlane skyline system. The McFarlane system is especially adopted for use in country where the logs have to be removed from steep hillsides. A 1.5-inch steel cable is anchored to standing timber on the crest of the hill, the other end being fastened to the hoisting drum of the donkey. This cable may be carried a distance of 4,000 feet under favorable conditions; that is to say, where the weight of the trailing logs will not cause too great a sag.

A carrier or trolley attached to an endless line brings in the logs, clearing the entire hillside within the limits of its travel.

When one portion has been cleared the main cable is moved to a new location, and so on until a radius of from 3,000 to 4,000 feet has been cleared of timber. The logging engine may remain in one place for two or three weeks and thus save the expense of moving continually, which the older method of ground haulage involves. Also the logs are in much better condition for the sawmill when they have not been hauled bodily over the gravel and rocks. Pieces of gravel in the latter case are embedded in the bark with disastrous results to the saws when they come in contact with them.

The skyline method permits of much faster handling, as the logs, having only one end trailing, are not likely to encounter obstacles.

The electrical equipment of each machine consists of one 150-horsepower, 550-volt, 600-revolutions-per-minute, 60-cycle, three-phase wound-secondary logging type motor, equipped with a solenoid brake. The motor is totally inclosed and of very substantial construction to withstand the exceedingly hard service the work involves. The control consists of a seven-point controller connected to a bank of resistance grids located in the rear of the skids on which the machine is mounted. The controller also operates the primary circuit, making the drive self-contained.

As a safeguard a time-element oil circuit-breaker switch is also installed, together with an ammeter mounted in view of the operator, who is thus able to determine the safe stresses he can place on the steel cable. In practice

it has been found that the cable is the weak link in the chain, the motor being able to take care of any and every load applied so far.

The brakes are operated by air from a compressor driven by a 7.5-horsepower motor. Compressed air also operates the signal whistle, a very important feature of logging equipments, as in most cases of long haulage the operator cannot see the load on starting, but must depend on signals, given by the hook tender, as to what he has to do.

Power is transmitted at 11,000 volts from the sawmill power plant located 3.5 miles from the present logging operations. Portable substations mounted on flat cars, step the voltage down to 600. Power is then supplied to the motors by triple-conductor No. 000 cable, steel armored, and lead covered. Expulsion fuses and horn-gap arresters protect the primary side of the 200-kilowatt three-phase oil-cooled transformers.

The line construction has been made as simple as is compatible with safety, and inclusive of all charges, clearing right of way, material and labor, but cost of land not included, amounted to $767 per mile.

The average daily haul for the month of April, 1913, was 33,000 feet for No. 1 donkey; an excellent showing, everything considered. On May 13, the machine under test brought in 55,000 feet of logs, establishing a record. When certain mechanical defects in the equipment have been rectified it is expected that this record will be exceeded.

The rate of travel of the trolley at present is 1,000 feet per minute hauling in an average load of 1,700 log-feet. It is expected to increase this rate of travel to 1,200 feet per minute on the new carrier shortly to be placed in operation.

It is to be remembered that the white pine logs in this district are small compared to the fir and cedar of the Coast timber, where the distances hauled would have to be shortened considerably.

For the test, a curve-drawing wattmaker was used with an indicating wattmeter as check; an ammeter and a voltmeter were used to check power-factor.

Running out light the carrier showed an average power input of 63 kilowatts.

Hauling in logs scaling 1,000 to 1,500 feet showed an average power input of 104.1 kilowatts.

Loading logs on cars averaged an input of 80 kilowatts. Power-factor equaled 68 per cent, average.

A decided saving in time and power consumption would be effected by using a separate motor and light hoisting apparatus for loading and so permit loading and handling at the same time. At present the one hoist has to do duty for both operations, for which it is not suited. A 50-horsepower motor would have ample capacity for loading logs either on rollways or cars.

The advantages of electric over steam haulage can be summed up briefly.

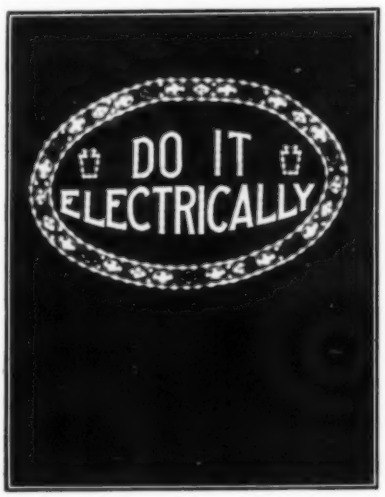
No fuel required, with consequent wastage of good lumber averaging about 1,000 feet per day for each engine.

Elimination of fire risk in the forest.

Lower labor costs; no firemen or wood cutters required to supply fuel.

No freezing of boiler tubes in winter and consequently no charge for night watchman in cold weather.

Maintenance costs less than with steam; boilers have to be washed every two weeks and engines with reciprocating parts are harder on upkeep.



Slogan Sign of the Toledo Railways & Light Company.

No water required. This is often a serious item, it being necessary in many cases to pump water for a distance of two miles.

No delays to get up steam and no shut-downs through failure of pressure, a frequent happening on very long hauls.

No danger of boiler explosion.

Greater adaptability in regard to speeds, which can be increased beyond standard engine speeds at present in use.

The output of each machine can be standardized readily.

The output of steam donkeys will vary in ratio to the attention paid to proper firing.

It is estimated that a saving of at least 50 cents per thousand would be effected.

During 1911 the St. Paul & Tacoma Lumber Company, between contracts and camps hauled 81,000,000 feet, log scale. On combined operations the gross saving would be $40,500, from which the cost of energy would have to be deducted. The records on the Potlatch test average 10 kilowatt-hours for each 1,000 feet logged. This varies somewhat, but is sufficient for practical purposes.

This 810,000 kilowatt hours per year at the rate of 1.5 cents equals $12,150; and $40,500 minus $12,150 equals $28,350 saving effected, even at a minimum of 50 cents per thousand. The saving in elimination of one of the gravest fire risks can hardly be estimated in dollars and cents, but would pay a heavy interest, without any doubt.

The development of logging by electricity will provide a valuable load from the central-station point of view, especially on the Pacific Coast where transmission lines from hydroelectric plants pass through extensive logging areas.

New Slogan Sign in Toledo.

"Do It Electrically"—the slogan adopted by the Society for Electrical Development, Inc., is being advertised extensively in Toledo, Ohio, in the form of a monster electric sign installed on the Walding, Kinnan & Marvin Building by the Toledo Railways & Light Company. The sign, which is considered the most attractive in the city, is 25 feet long and 16 feet high. The border is of Persian design, in eight colors. The two keystones are in red and the lettering white. About 1,500 10-watt Bryan-Marsh Mazda lamps are used.

The sign is the gift of Henry L. Doherty, president of Doherty & Company, who control the Toledo property, to the city, and it is announced that as president also of the Society for Electrical Development, Mr. Doherty will install a similar sign in each of the cities served by his company.

As to the effect of this sign on central-station business in Toledo, the company writes that much favorable comment has been received and the sale of several additional signs can be attributed directly to the influence of this installation.

Worcester Makes Heavy Gains.

Growth in the business of the Worcester (Mass.) Electric Light Company has been phenomenal. The output of energy in August of this year was 1,480,450 kilowatt-hours in excess of that of August, 1912, representing an increase of 78 per cent. The output for August, 1912, was 1,889,100 kilowatt-hours while the same month this year it amounted to 3,369,550 kilowatt-hours. A part of this increase was power sold to the Connecticut River Tranmission Company.

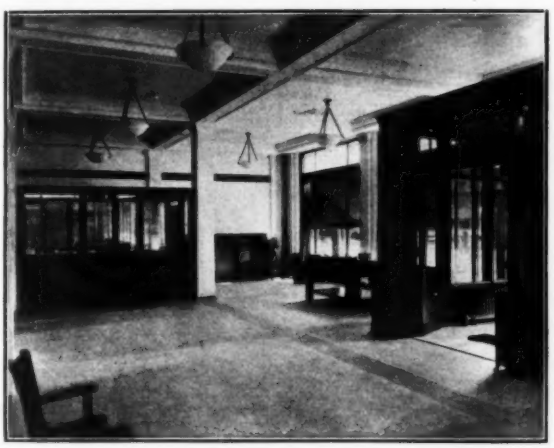
New Central-Station Building in Ann Arbor.

All that is modern and desirable for a central-station office building has been incorporated in the new home of the Eastern Michigan Edison Company, at Ann Arbor. The accompanying illustrations show the exterior appearance and two views of the interior. The building is of steel and concrete construction throughout and is thoroughly fireproof. It has been constructed with the view to ultimately adding three additional stories when the business of the company demanded it. The present structure, measuring 66 feet front by 74 feet deep, comprises two stories and a basement. The cashiers' cages and display racks and tables are located on the first floor, as shown in one of the views. The general offices, Manager Hemphill's office and engineering department offices are located on the second floor. On this floor there is also a completely equipped meter testing laboratory. The store rooms and repair department are in the basement.

In one corner of the building a garage has been built where the company's machines are kept, available at a moment's notice to answer all emergency and trouble calls.

The indirect system of lighting has been used exclusively throughout the building. Outline lighting, around two sides of the building has also been provided.

The citizens of Ann Arbor point with pride to the Eastern Michigan Edison Company's new building as it is the most modern and attractive structure in the city. Public meetings of all kinds are invited to use the building as an auditorium and the company takes advantage of these affairs to cement the feeling of good will that exists between public and itself.



Four Views of the New Building of the Eastern Michigan Edison Company at Ann Arbor.

New Office Building in Lexington.

The Lexington (Ky.) Utilties Company will shortly have a new office building which will be modern in every particular. A building on Main Street, in the heart of the business section, has been leased, and will be remodeled to suit the purposes of the company.

The first floor will be given over to the display of appliances and demonstrations of the company's service. The second floor will largely be devoted to club purposes, with facilities for dancing, reading and billiard-playing for employees of the company. The third floor will be used as the administrative offices of the Company.

The building will be used in connection with the Kentucky Traction & Terminal Company, which will use the first floor as a depot and waiting-room for its interurban traffic.

New Albany Centennial.

The central stations and traction companies in New Albany, Ind., have contributed materially to the success of Centennial Week in that city, which begins October 12 and celebrates the hundredth anniversary of the founding of the city. The companies have used their paper *The Booster*, as a kind of official organ for the event, and for several months past it has been devoted to exploiting the celebration. Anderson G. Moore, commercial agent of the traction lines, has been in charge of the publicity end of the affair, and has seen to it that it has been widely exploited in New Albany and vicinity.

Electrical Construction

INSTALLATION OF RIGID-CONDUIT WORK IN BUILDINGS OF CONCRETE CONSTRUCTION.—I.

By G. N. McCarthy.

In planning a conduit installation in a reinforced-concrete building, the architect's plans being available, practically the same procedure is followed as with a building of any other type. The architect usually specifies the location of the outlets, panel boxes, and switches, and his plans should be carefully studied to determine the best and most direct routes for the runs, and to ascertain how the installation can be installed with a minimum cost for material and for labor. One thing that should be watched particularly is the space allowed for horizontal runs of conduit on the top of concrete floors. Frequently, sleepers of a depth as small as two inches are specified, and where such are used it is impossible to cross a couple of medium size conduits without cutting the floor, or the flooring, or the concrete slab. Usually, if a difficulty of this sort is detected during preliminary study of the plans, provision can be made for installation of deeper sleepers, which will probably eliminate the difficulty.

A typical concrete floor construction is indicated in Fig. 1. A wood form is built of the shape that the concrete floor slab is to assume, and the form being in place, the concrete is poured in, filling the form up to the proper level. In Fig. 1 steel beams cast in the concrete support the floor. This is not true of reinforced-concrete construction. In the real reinforced construction, steel rods cast in the concrete near the lower faces of the slabs and beams take the tensile stresses, while the concrete assumes practically all of the compressive stresses.

The form of floor construction shown in Fig. 1 is, however, much used in steel-frame buildings, because it provides a strong, fireproof floor. After the concrete is set the forms are removed, of course. Sometimes the ceilings are plastered, and sometimes the rough concrete forms the ceiling. Which finish is selected is determined by the class of tenants that will occupy the building. In an office building concrete ceilings would invariably be plastered, while in a warehouse or industrial plant, plaster would be unnecessary. It is necessary for the wireman to know whether or not the concrete ceiling is to be plastered before he starts setting outlet boxes in the forms, because to a certain extent the arrangement of the outlet boxes is different where ceilings are to be plastered from those where plastering is unnecessary.

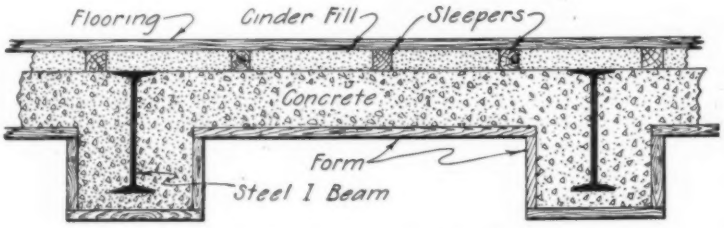


Fig. 1.—Typical Concrete Floor Construction.

Sometimes the concrete upper surface of the floor slab forms the floor for the story above. It is the practice, however, in office buildings to build wooden floors over the concrete, as illustrated in Fig. 1. To form nailing strips for the wooden floors, sleepers, possibly two inches by two inches or three inches by three inches in cross-section, are laid on top of the concrete slab. The spaces between the sleepers are, as illustrated, filled with cinders, which forms a fireproof, and sound-deadening medium; then, the wooden floor, which is usually of a hard wood, such as oak or maple, is nailed to the soft-wood sleepers.

The first conduit work that was installed in concrete floors was put in after the concrete had been cast and allowed to set. When concrete was first introduced as a floor slab material it superseded terra-cotta. With terra-cotta it was an easy matter to drill from the floor above down through the terra-cotta tile constituting the floor slab, to provide holes for conduit serving the outlet boxes in the ceiling below. Following the line of apparent least resistance, endeavors were made in the first conduit jobs in concrete floors, to install them in the same way, i. e., the holes were not drilled for the conduit and outlet boxes until the concrete was hard, which resulted in excessively high installation costs. An outlet box installed in this manner had somewhat the appearance of that indicated in Fig. 2. One hole was drilled down through the slab for the box and for the conduits which served it. The horizontal portions of the conduits lay on the top of the floor slab above, and were imbedded in the cinder fill upon completion of the floor. Besides the high installation cost, another disadvantage of drilling outlet-box holes in the concrete slabs was that due to the breaking away of the concrete; much larger holes than were really necessary were often formed. Because of this the outlet boxes would be readily shifted laterally from the position they should occupy, which resulted in an unsightly installation. It was found that drilling the concrete was such slow work that the wiremen were always considerably behind the other tradesmen, which involved a great many arguments to prevent their being forced out of the way to make room for other workers.

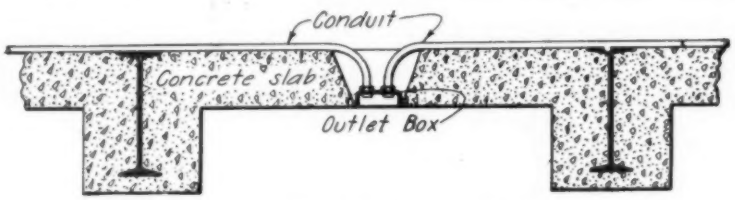


Fig. 2.—Conduits Bent Into Outlet Box.

A method of casting holes in concrete floors has been used to provide for the installation of outlet boxes. Fig. 3 shows the arrangement, wherein a wooden plug is attached to the form and the concrete poured around it. When the concrete has set and the forms removed the plug remains in position until the wireman is ready to install the outlet boxes. Then, the plug, because of its taper shape, can readily be driven upward, and the box put in place. The diameter at the bottom of the plug is a trifle greater than the outside diameter of the outlet box to be used. The taper should be about equivalent to that shown in Fig. 3. The plugs are tapered for two reasons; one is so that they will turn out easily and the other, so that they will not fall down through the hole when the form is removed. The plugs were held in their positions on the forms by nails extending from the outside of the forms into them. When the forms were taken down, the nails were readily pulled out of the plug.

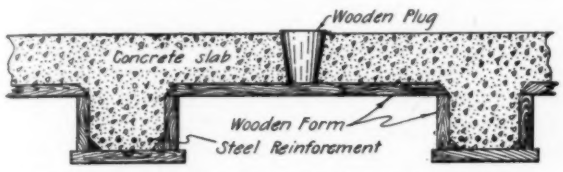


Fig. 3.—Wooden Plug for Outlet Hole in Floor Slab.

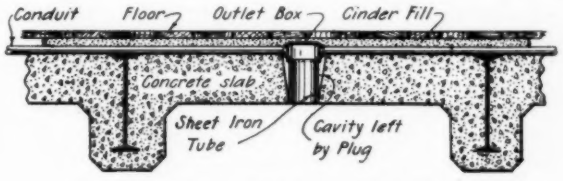


Fig. 4.—Outlet Box with Extension Tube.

This method of involving the use of wooden plugs was rather expensive because a great many plugs were required on each job, and, inasmuch as they have to be accurately turned, their aggregate cost was considerable. It was seldom that the same plugs could be used on two different jobs because of the varying thicknesses of the floor slabs.

Two methods of installing outlet boxes in the holes formed by wooden plugs have been used. One is indicated in Fig. 2 and another in Fig. 4. In Fig. 2, the ends of the conduits serving the outlet boxes are so bent that the bends will lie within the hole. Therefore small bends are often necessary and frequently it is impossible where the floor slab is thin, to form bends of the minimum radii specified by the Underwriters into the space available. However, under favorable conditions, this arrangement is fairly satisfactory.

The other method of installing an outlet box in a hole left by a wooden plug is shown in Fig. 4. In this case the conduits run straight into the outlet box, which rests almost on a level with the top of the concrete slab. Extending down from the outlet box to a point flush with the surface of the ceiling below is a sheet iron tube. The installation of this tube is necessary to satisfy Underwriters' requirements. Small ears can be formed on the upper end of each tube through which screws can pass into the lugs on the outlet box. These screws support the tube. It will be noted that since there are no bends in the conduit with the method of Fig. 4, it does not have the disadvantages of that of Fig. 2, but it is, of course, necessary to furnish the sheet-iron tube for each outlet, which is an added item of expense.

Outlet boxes and the conduits serving them are now almost invariably cast in the floor slabs as indicated in Fig. 5. This method is much more satisfactory and economical than that of Fig. 2 or 4. The outlet box is fastened to the form at the proper location by one of the schemes described elsewhere herein, and the conduit is made up into the box. The character and the construction of the steel reinforcing will determine how the conduit must be disposed within the form. Where steel I-beams are used, as in Fig. 2, it is necessary for the conduit at each beam to come up over the beam. This is not always necessary where the beams are reinforced concrete. With the reinforced-concrete construction it is often possible to arrange for the conduit to be imbedded its entire length, from the outlet box to the panel box.

Nearly all concrete slabs are reinforced with either netting or small rods. In no case is this slab reinforcement indicated in the illustrations in this article. The outlet boxes should be so arranged in the forms that the slab reinforcement will not interfere with them. Where wire netting reinforcement is used it is usually necessary to cut away a few meshes of the netting to permit the box to pass down through the netting and come in contact with the top of the form. The conduit can lie on the top of the netting. Where small rods are used for slab reinforcement, it is frequently possible to bend them aside sufficiently to provide for the admission of one box.

Chases for Conduits.

Chases for conduit runs in reinforced concrete buildings are sometimes indicated in the plans drawn by the architects. Where this procedure is followed, the forms are made so that the chase, or conduit way, will be cast in the concrete as it is poured. The chases for conduit and the method of preparing the forms for them are illustrated in Fig. 6. After the concrete work on a building thus constructed is completed, the conduit is erected in chases, and then plastered over. This method has been used almost wholly for vertical conduit runs. While the method offers certain advantages if carefully and systematically worked out, it has not been found entirely satisfactory in practice, because the architect that designs the building, whose duty it is to specify where the chases should be cast, usually endeavors to reduce the number and the lengths of the chases to a minimum. It has sometimes occurred, therefore, in large building jobs, that only one vertical chase has been provided for the risers for all of the floors. The result was that in order to reach the various distribution centers on the different floors, horizontal runs of conduit were necessary, which involved a waste of conduit and electrical material. The forms

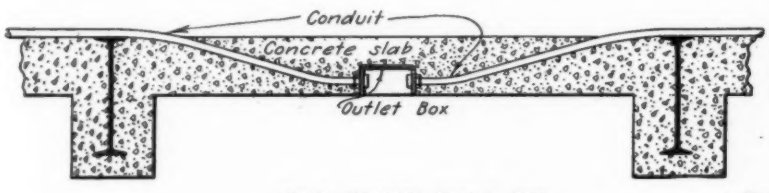


Fig. 5.—Conduits Cast in Slab.

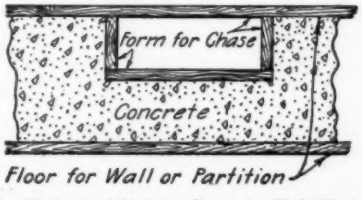


Fig. 6.—Method of Making Form to Mold Chase.

for these chases are relatively expensive to build, and if they are to be effective must be carefully located, and it has been general experience that many errors are made in the locating of these forms, from which much trouble ultimately resulted.

The provision and location of chases for vertical wire ways in a concrete building is a matter that requires considerable consideration. Frequently, architects lay out a building design without giving due consideration for the space that must be occupied by the vertical risers. As a rule it is not difficult to locate and install the horizontal runs of conduit because they are usually of small diameter, but the vertical runs which contain the feeders are often large, possibly three or four-inch pipe. Unfortunately, it is frequently the case that architects specify that these risers shall be located in partitions, or places that if the plans were followed, would be so full of heating and other piping that it would be impossible to locate the risers in the spaces specified. It is, therefore, of great importance at the start of every job to study the plans carefully and make sure that some provision has been made for accommodating the risers.

Before the sleepers are put down in a reinforced-concrete building all the conduit should be snaked; that is, a fish wire should be pushed through every length, so that the wireman may be certain that there are no obstructions. If obstructions are located at this stage, it is not particularly difficult to remove a certain amount of concrete at the point where the obstruction exists and remove the fault, and put in a new length of conduit, and then fill the hole left by this procedure full of concrete. If, however, the conduit is not snaked for obstructions until after the floors are down, it is very expensive to remove obstructions, and a thoroughly first-class job is almost impossible to obtain.

Direction of Conduits and Reinforcing Rods.

The relation of direction of conduit in forms to the steel reinforcing rods is a feature which must be given consideration. It is preferable, as a general proposition, that the conduit lines run parallel to the main reinforcing rods, as shown in Fig. 8. If the conduit lines run at right angles to the main reinforcing rods, as shown in Fig. 9, and near the bottom of the slab, the real effect is to reduce the cross-section of the slab by a height equal to the diameter of the conduit (Fig. 10). Inasmuch as the concrete below the center of the slab is in tension, the slab may be materially weakened by conduit running at right angles to the reinforcing rods if the conduit is near the lower face. The concrete near the lower face of the slab is much more effective in withstanding bending stresses than that near the center.

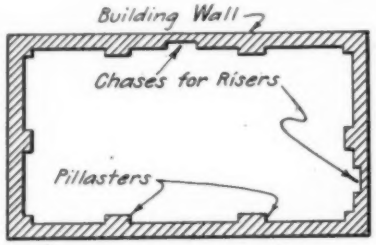


Fig. 7.—Chases for Risers.

A statute has been proposed in one state, at least, prohibiting the installation of conduit runs in slabs at right angles to the main reinforcing. Obviously, this matter becomes of great importance when the conduits involved are large in diameter.

Telephone Conduits.

Conduits for telephone and signal cables are frequently specified by architects for reinforced concrete buildings. Usually, a large conduit, possibly two inches in diameter, is carried from the telephone terminal-and-cross connection board, which is usually located in the basement, to the point where the telephone switchboard is to be located. If several telephone switchboards or terminal boxes are to be installed in different portions of the building, it is usually necessary to carry a separate conduit line to each one of these. These conduit lines are, for the most part, vertical, and are cast solid in concrete cells or partitions.

Building the Floor.

The procedure during construction of a concrete floor is thus: The wireman installing the conduit and outlet boxes on the forms should endeavor to keep just ahead of the gang that is pouring the concrete. If the wiremen work too far in advance of the concrete gang, the chances are that much of their labor will be wasted, because the conduit and boxes will be displaced if they are left too long before being covered with concrete. The outlets and the conduits between the outlets should be put in place on the forms, and a length of conduit started toward the distribution box. Enough conduit and boxes should be placed at a time to insure that the pouring gang will not cover any forms with concrete before the outlet boxes and conduits that should be there are placed. After the concrete has been poured and has set, the forms are removed and the con-

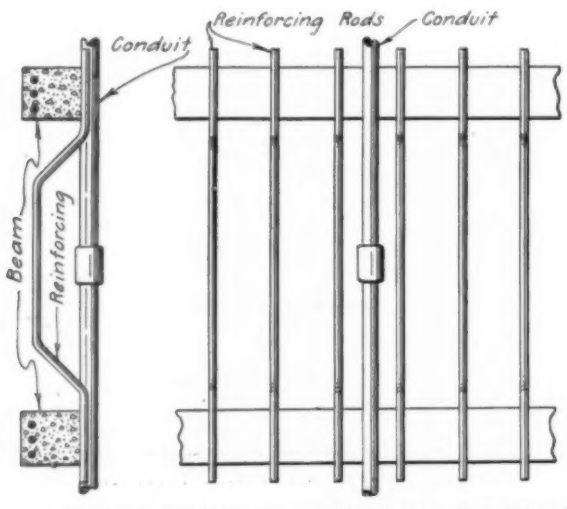


Fig. 8.—Sectional and Plan Views with Conduits Run Parallel with Main Reinforcing.

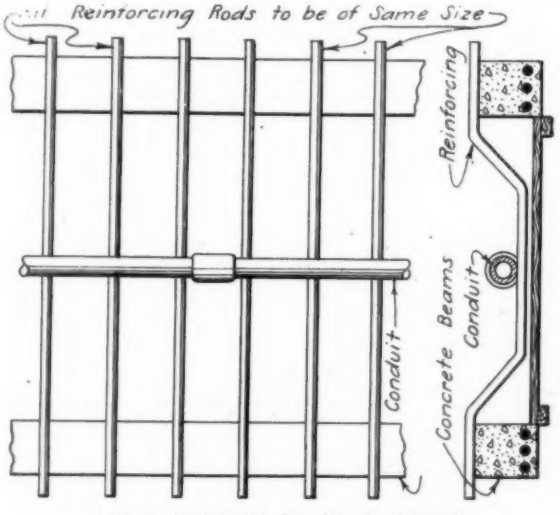


Fig. 9.—Undesirable Location for Conduit.

conduit ends that protrude from the concrete can be extended back to the distribution box.

If the detail work is installed in accordance with the directions just given and all the boxes are securely fastened in place, the electrical work can rest until the building is completely plastered. Of course the usual precaution

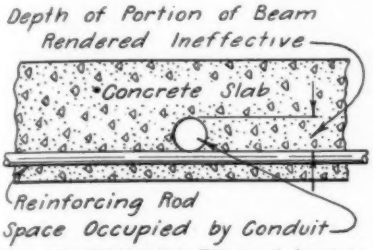


Fig. 10.—Weakening Effect of Improperly Located Conduit.

of installing wooden plugs in the ends of all the conduits at the various outlets would have to be followed. After the plastering is completed, then, the contractor should experience no difficulty in installing his wires, panel supports, and switches, and completing the job.

To prevent the entrance of concrete into the interior of the conduit, some sort of a filling compound should be used on all of the screw joints. White lead is the usual material, and has been found quite satisfactory. It should be applied in a thick coat, so that it will effectively prevent any leaks, but at the same time there could be enough dabbed on the thread so that it would get to the inside of the conduit.

Supporting Horizontal Runs.

A method of supporting horizontal runs of conduit in forms for concrete is illustrated in Fig. 11. Outlet boxes can be held in position on the forms by the method described in connection with Fig. 12, it being necessary to nail the box to the form either as it is built up (Fig. 11) or to nail the box to one side before the other side is erected. It is considered preferable in good work to protect horizontal runs of conduit with a piece of timber held to the side of the form by screws, turning in from the outside of the form. Where concrete is dumped and falls on horizontal runs of conduit from any considerable height, the conduit is apt to be displaced or bent, and a protecting piece of timber, arranged as shown in Fig 12, insures against damage that might result from such treatment. The protecting piece of timber should be removed from the form when enough concrete has been poured to almost reach the timber. This can be effected by pulling the protecting piece up by wires which were attached to it before it was fastened in the form. The screws that hold the piece turn into it from the outside; hence, can be readily withdrawn. Not alone does the protecting piece protect the conduit from concrete dropping on it, but it also insures that the spade-like tools used in churning the concrete up and down at the face of the form, will not interfere with the pipe. These churning tools are manipulated by unskilled laborers that do not appreciate the importance of not disturbing the conduit.

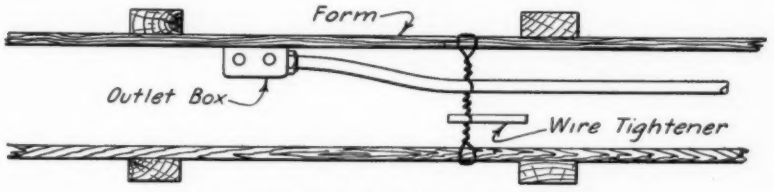


Fig. 11.—Horizontal Run of Conduit in Form.

Conduit runs between boxes in floor slab forms usually require no special supports except in exceptional cases. The reason for this is, that the distance between ceiling outlet boxes is usually small. It is, however, frequently desirable to tie the conduit with pieces of soft iron wire to the steel reinforcement, as illustrated in Fig. 13. The men that pour the concrete have little consideration for the conduit in the forms, and are very likely to unintentionally dislodge it unless it is securely held in place. Every precaution should be taken to prevent such dislodgement. A wireman should always be on the job when concrete is being poured around conduit.

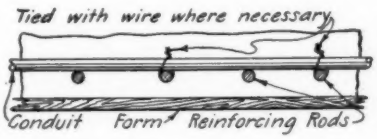


Fig. 13.—Conduit in Form Tied to Reinforcing Rod.

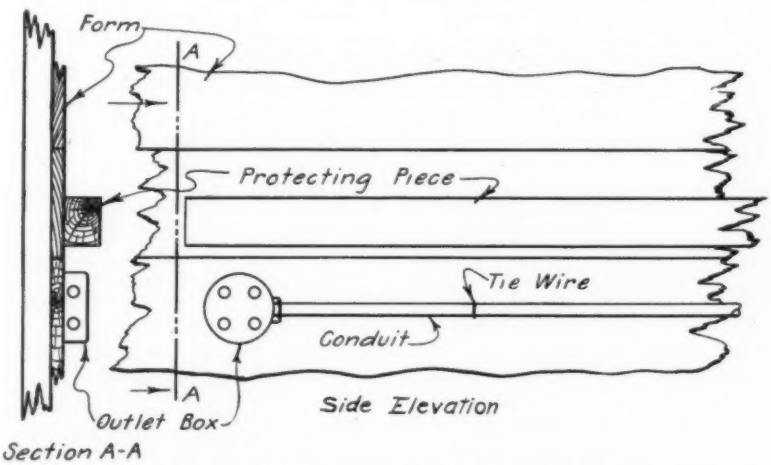


Fig. 12.—Plan View of Horizontal Run of Conduit in Form.

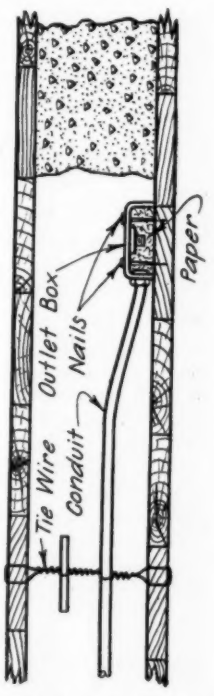


Fig. 14.—Method of Tying Vertical Run of Conduit in Form.

A method of supporting in forms where there is no steel reinforcement wire is looped between the two outer

surfaces of the forms and straddles the conduit. A wire is then twisted between the conduit and each side of the form until it is drawn taut. A sufficient number of these tie wires should be used to prevent any possible displacing of the conduit. It is a good plan not to depend altogether on the fastenings securing the outlet boxes, to hold the conduit and outlet boxes in position, because under certain circumstances, an enormous leverage may be imposed on a box by a pressure against a long conduit connected to it.

Deep outlet boxes should be used where cast in concrete. This is necessary for two reasons. One is so that the conduit to the box may lie on top of the netting, or above the reinforced rods if slab reinforcement is used; the other reason is so that the conduit will be far enough in from the surface of the ceiling to prevent the ceiling breaking out, or cracking along the conduit. A box 2.5 inches deep usually works out nicely. If a shallower box is used, considerable bending of the conduit is usually necessary.

(To be continued.)

New Officers for Electrical Workers.

The convention of the Brotherhood of Electrical Workers' Unions closed in Boston on September 30. The following officers were elected: Frank J. McNulty, Newark, N. J., president; Charles M. Ford, New York City, secretary; W. A. Hogan, New York City, treasurer; G. M. Bugniazet, James J. Noonan, L. C. Gressa, vice-presidents; G. W. Whitford, Frank L. Kelley, Frank Swor, M. J. Boyle, C. C. Yeabower, Executive Committee. The next convention will be held in San Francisco in 1915.

Omission of Neutral Fuse.

The Commonwealth Edison Company, of Chicago, has issued a circular letter to the electrical contractors of the city calling attention to a ruling of the company which has been effective for some time prohibiting the installation of a fuse in the neutral pressure tap for a meter when this tap is installed for pressure purposes only. It is also requested that in the installation of neutral taps for meters these taps be soldered directly to the neutral main. If this procedure is not followed and the neutral tap is placed under the binding posts of the cutout, solder must be used.

The Emmons Electric Company, of Chicago, has secured a contract for the installation of the wiring for 700 incandescent lamps in a new building in Chicago.

The Passing of the Mile as a Unit of Electrical Measurement.

In the infancy of the electrical industry many units were used to signify quantities and conditions of the new form of energy. But many of the available units were not well suited to electrical measurements. It was necessary to devise new units in order to insure a better understanding of the actual conditions and to provide for greater efficiency in the long run.

It is undoubtedly because of this early necessity for breaking away from traditions that the electrical engineering profession has always been among the first to adopt new methods and new units. A pertinent example is the invention and use of the circular mil, which has eliminated the use of the constant 3.1416 from computations of the cross-sectional area of wires and cables. It now seems probable that the practically universal unit of length, the mile, is to be superseded by 1,000 feet as a standard. Tables on costs and prices of wires and cables have been figured on this new basis for some time. Conductor resistance, particularly in the case of copper wire, is now commonly tabulated in ohms per thousand feet instead of in ohms per mile.

It is interesting to note in this connection that the Simplex Wire & Cable Company has recently abandoned the use of one mile as a unit of length for all factory measurements. This applies not only to conductor resistance but to insulation resistance (megohms per 1,000 feet), capacity (microfarads per 1,000 feet), and inductance (henrys per 1,000 feet). By adopting 1,000 feet as the unit of length for all electrical measurements at the Simplex factory and thus eliminating (from about a thousand calculations daily) the factor 5280, an immense amount of figuring is avoided. In comparing the new standard with the mile, a close approximation for general use—involving an error of less than six per cent—is to multiply or divide the mile standards by 5. For insulation resistance calculations at least a six per cent error is well within the limits of manufacture. In fact, as the change does not seriously conflict with former standards it would surely seem to be along the lines of simplicity and efficiency.

Testing of Wires and Cables.

Of the various electrical tests made to insure the integrity of wires and cables, the most common are the insulation resistance test and the voltage test.

The following discussion is based on the theoretical assumption that the insulation resistance is proportional to log D/d and the voltage within limits is proportional to d log D/d, where D is the outside diameter of the insulation and d the diameter of the copper.

Insulation Resistance Test.—The insulation resistance may be expressed by the formula

$$I = A \times L \times \log\ D/d;$$

where

I = insulation resistance;
A = constant depending on dielectric;
L = length of wire;
D = outside diameter of insulation;
d = diameter of copper;

If the insulation resistance is always taken in terms of the same length, i.e., L = 1,000 feet, the formula reduces to

$$I = A \log D/d.$$

From this formula it will be seen that the insulation resistance for a wire of any dimensions may be readidly computed after finding by experiment the constant A for any given dielectric.

Voltage Test.—The correct voltage test to apply to wires and cables of different sizes with the same dielectric may be obtained by the formula

$$V = K \times d \times \log D/d;$$

where

V = volts;
K = constant depending upon dielectric;
D = outside diameter of insulation;
d = diameter of copper;

This formula, however, is only applicable when d is larger than $D/2.72$, or approximately to the point where the thickness of insulation is equal to the diameter of the copper. When d is less than $D/2.72$ the formula must be used as though the wire had a diameter of $D/2.72$. In other words, when the diameter of the copper is less than $D/2.72$ the wire can be tested only as high as if the copper diameter were $D/2.72$. To put it differently, when the diameters of copper are less than $D/2.72$, all wires with the same outside diameter take the same voltage test. From the above formula, it will be seen that the correct voltage tests for any wire may be readily computed after finding by experiment the value of the constant K for any given dielectric.

According to the experience of the Simplex Company's engineers, the voltage test is the best means of searching out possible imperfections in insulation, and the use of the formula noted above is recommended. It will be noted that this formula gives more severe voltage tests for the same thicknesses of insulation on large wires than on small wires. This is because, as the wire size increases, the actual stress per unit of area diminishes, a fact which will be appreciated when it is considered that we are dealing with cylindrical and not flat surfaces.

It is not believed that the custom of testing a wire or cable at two and one-half times the working pressure is adequate in all cases, nor that it is safe to assume in all cases that a cable can be used at a working pressure of 1 ÷ 2.5 or at 40 per cent of the voltage, it will safely stand in a factory test. For example, a test of 1,500 volts on a No. 14 wire with a 3/64 inch wall where the wire

is to be used on 600-volt service, may be adequate to search out possible faults, but on a 1,000,000 C. M. cable, however, which has a 7/64 inch wall of insulation for 600 volts working pressure, a test of 1,500 volts seems inadequate. The 7/64 inch wall is put on for mechanical reasons.

Capacity for Testing Apparatus. According to matter prepared by the Simplex Company, the size of electrical apparatus necessary in voltage testing with alternating current is not generally appreciated. This may be due to the fact that, as these tests are made on open circuit, many persons assume no current is required. However, there *is* current flowing and the amount is shown by the formula

$$I = \frac{2\pi f\ CE}{1{,}000{,}000}$$

where I = current flowing into the cable;
E = testing voltage;
f = frequency;
C = electrostatic capacity of cable in microfarads.

But the size of apparatus is dependent upon the watts required or

$$\text{Size} = \text{Watts} = I \times E$$

$$= \frac{2\pi f C E^2}{1{,}000{,}000} \times E = \frac{2\pi f C E}{1{,}000{,}000}$$

This means that the watts are proportional to the frequency, capacity and *square of voltage,* and on high-voltage tests this means large apparatus. For instance, 1,000 feet of a 500,000-circular-mil cable with 6/32 inch wall of 30-per-cent Para has a capacity of about 0.33 microfarad. With a frequency of 25 cycles, this formula shows that 1.3 kilowatts capacity is required to test at 5,000 volts. If this cable were to be tested at 30,000 volts, apparatus thirty-six times as large, or of about 47 kilowatts, would be required. If 60 cycles instead of 25 were used, a 30,000-volt test would mean that the apparatus would have to have a capacity of about 113 kilowatts.

According to the best expert information there is no appreciable difference of severity between testing at 25 or 60 cycles on ordinary factory tests.

A Chicago Contractor Adopts Easy-Payment Plan.

Alex. M. Knauber Company, a firm doing an electrical contracting business in Chicago and suburbs, is distributing an attractive card containing the following very interesting announcement:

"Our modern methods make it possible to wire any building for electric light or power.

"Our easy-payment plan brings the great comfort and convenience of electric service within the reach of everybody. We will wire your building, furnish and install fixtures, and allow you 24 months to pay the bill.

"Drop us a postal, and we will show you how easily and economically it can be done. Estimates furnished and work executed in any part of Chicago."

Among the Contractors.

The Farnsworth Electrical Company, Bowling Green, Ky., has completed an important job, that of wiring a new church building erected for an Episcopal congregation. A number of unusual features were incorporated into the job.

The Schenk Electrical Company, of Knoxville, Tenn., is one of the exhibitors at the National Conservation Exposition, which is now being held in Knoxville.

The Electric Shop, Buffalo, N. Y., of which L. W. Wipperman is president, is putting in the entire electrical installation in the new million-dollar Technical High School of Buffalo. The installation is of the most modern type throughout and includes light and power equipment, telephone exchange, fire alarm and all the necessary fixtures. Two other school jobs under way at present by this company are the wiring installation in the Hutchinson High School and that in Grammar School No. 32.

James Riley, electrical contractor, of Buffalo, N. Y., has recently moved from 8 Ellicott Street to larger quarters at 21 East Huron Street.

The White City Electric Company, of Chicago, is doing a large job of electrical construction for Reid Murdock Company, Chicago. Some 2,000 incandescent lamps and 40 motors will be installed.

J. F. Raymond & Company, of Cincinnati, O., has the contract for the installation of the electric wiring and fixtures in the three-story garage of T. P. Carroll, in Mt. Auburn, a suburb of Cincinnati.

The Fostoria Electrical Supply and Motor Company, of Fostoria, O., has secured the contract for the electric wiring in the McLean Public Library, in Fostoria.

The National Electric Company, contractor, has established offices in Lexington, Ky. The members of the company are William Carter and F. J. Walcott. One of the jobs recently secured is wiring a new livery and sales barn for Tattersall's, well known horse dealers.

O. M. George, of Chicago, is running the circuits for 500 incandescent lamps in the Bismarck Hotel, Chicago.

F. Leasure & Son, of Chicago, is wiring a building at 1225 North Clark Street, Chicago, for 600 incandescent lamps, 5 arcs and 4 motors.

A. A. Shea, of Springfield, Mass., has been awarded the contract for the electrical equipment of the new high school building in that city.

The contract for installing the electric fixtures in the new Supreme Court building in Tallahassee, Fla., has been awarded to John I. Bronson & Company, of Jacksonville. The contract amounts to about $30,000.

The municipal commission of Dallas, Tex., has awarded the contract for the electric wiring in the new City Hall to W. M. Clower Electric Company. The contract price being $7,960.

F. J. Irvin, who conducts an electrical contracting business in Canton, Ill., has secured a contract to install an electric plant in the Industry Township High School, near Canton. It is interesting to note that the domestic science department of this school will be fitted up with three electric stoves and a large number of other electric culinary appliances.

The Wolever Electric Company, a prominent firm of electrical contractors and dealers with headquarters at 642 Main Street, La Fayette, Ind., is rewiring the Theime & Wagner brewery, and also the plant of the Schwab Safe and Lock Company, both jobs being in the city mentioned. The latter contract includes the setting of 12 motors and the installation of the circuits for them. This company is likewise installing the electrical work in the plants of the Barbee Iron and Wire Works, the La Fayette Engineering Company, the Dryfus Packing Company, and the Anderson Folder Company. A total of 34 motors are being set and wired for in these four jobs, and in three of them the entire plant is being wired. The Wolever Company reports that the prospects for business in the late fall are unusually good.

The Caldwell Electric Company, of Champaign, Ill., has just finished the installation of a new street-lighting system in Champaign, the cost of the system being $50,000. The company mentioned is also constructing a high-tension transmission line four and a half miles long for the city of Springfield, and is finishing the wiring of the Masonic Temple at Champaign and that in the court houses at Mt. Pleasant, Iowa, and Morris, Ill. Still another important job now on hand is the electrical work in the dormitories of the State Normal University, at Carbondale, Ill. All of these jobs are high-class conduit work.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Cutting Flexible Tubing.

I have recently noticed some interesting kinks concerning cutting flexible tubing easily.

I never use a knife to cut this sort of material, except in cutting tubing of the larger sizes. I cut it with my pliers. Of course this flattens the tubing at the point where the cutting is done, but it can be easily opened up again by giving it a quarter turn and pinching it with the pliers. A piece of small tubing can be clipped in two as readily as can a piece of wire.

Even the larger sizes of tubing, up to the half-inch size, I usually cut with a small pair of oblique pliers. First I bite into it with the plier points, and then stick the points in the opening thus made and cut around as one would cut with a pair of shears.

C. W. Goddard.

A New Type of Stone Drill.

In using a drill made of a piece of pipe not long ago I had trouble in withdrawing it from the wall. In inventing a method of removing such drills readily I hit upon the following scheme, which I find to work well:

I cut threads on the reverse end of the piece of pipe that I am using for a drill, and attach a tee to it. Then, when I withdraw the drill, I slip a pipe through the tee, and by knocking on the inner side of this, the drill is readily withdrawn from the wall.

J. B. Josephson.

Annunciator Wiring.

Not long ago I was called upon to change the annunciator wiring in a building where there had been considerable confusion. The trouble was this: Once in a while it happened that two parties called at the same time; two drops would come up, and the office boy would set the annunciator back and answer the first call; then the next boy would come along and find the drops all set, with the result that one of the parties calling would be much put out because his call was not answered.

To do away with this confusion, I adopted the scheme of wiring shown in Fig. 1. I set eight push buttons in the manner indicated in the sketch. Now, when two calls come in together, the boy resets the annunciator and presses the button to bring down the drop he is not going to answer. Thus, when the second boy comes along, he finds the call which he is expected to answer indicated plainly.

The scheme is very simple. The

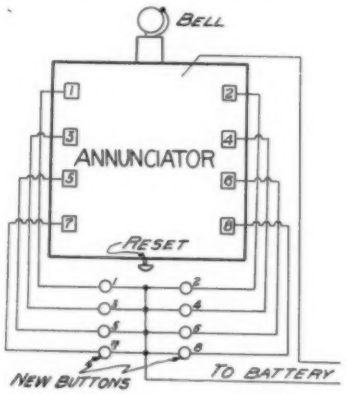


Fig. 1.—Wiring of Annunciator.

method employed simply closes the circuit normally through the annunciator bell and coils.

W. E. Rhodes.

A Handy Tool.

A tool that is very handy in house wiring is illustrated in Fig. 2. I use it to bore holes for risers in closed or blocked out partitions. It is made of a door knob and a ⅝-inch Irwin bit. The shank is cut off the bit and then thrust into the stem of the door knob, after which a hole is drilled through and a nail inserted to keep

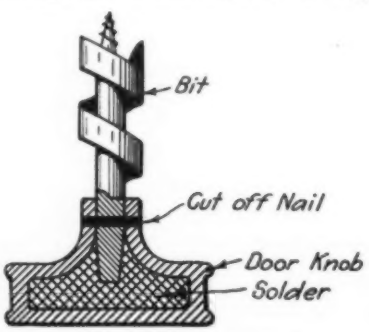


Fig. 2.—Handy Tool for Boring.

the bit from turning when it is used. It is also a good plan to fill the knob with solder and cut the nail off flush with the outer surface.

I wish also to take advantage of this opportunity to say a word concerning the method of tightening wires in cleat work described in the wiring kink by H. S. Percival in the issue of September 27. I find that by letting the jaws of the pliers take the place of the hammer handle the work can be done just about as well—at least for small wires. Still, Mr. Percival's method is a good one, and is something that is worth the consideration of any wireman who installs exposed-cleat circuits.

Karl S. Wonderly.

Hanging Heavy Fixtures.

In doing some repair work in the wiring of a theater not long ago I had to take down three large electric fixtures and install outlet boxes on the ceiling where they were attached. With the aid of my helper I had no trouble in getting the fixtures down, but when I went to put them back, after having fastened the outlet boxes in place, I got into trouble. I stood on top of a stepladder so that I could guide the fixture into the hanger, but the fixture had such a spread that the proximity of the ladder made it impossible to give it the necessary amount of turning. The way I finally handled the job was as described below:

Taking the fixture down, I loosened the insulating joint on it so that I could turn this readily with my hands. Then I got up on the ladder again and started the joint on the hanger, working it off of the fixture stem in the meantime until I got three or four threads caught. Then the rest was easy.

Frank Hansen.

Making Short Nipples for Conduit Work.

One of the best ways of making short nipples to be used in conduit work that I know of is to take standard dies, invert them in the stocks, and use a guide the next size smaller than the nipple which is to be cut. It is then only necessary to use a piece of pipe long enough to go through the guide and dies into the pipe from which the nipples are to be made. With this scheme, a wireman can cut any size of nipple that he wants without difficulty.

R. L. Flynn.

A Handy Pendant Switch.

Recently I was wiring a house for a man who desired a fixture over his bed in which there could be installed at will either a reading lamp or a pendant switch. I found that I could meet his requirements as follows.

In series with the regular wall bracket I wired a pull socket on a long cord. I instructed him that when he wished to use this as a switch he must screw a plug fuse into it, but that when a lamp was to be installed here, the fuse must be put into the socket in the wall bracket. It made a neat looking piece of work and the patron was much pleased with it.

Edward Winslaw.

Public Service Commissions

MASSACHUSETTS.

The Massachusetts Gas and Electric Light Commission has approved the issue of 1,500 shares of new capital stock, at $140 per share, by the Suburban Gas and Electric Company, one of the Tenney companies, which furnishes electricity in the town of Revere, Mass., the proceeds to be applied to the payment of notes outstanding June 30, 1913. The company asked for approval of an issue of stock of $239,200 par value, for the payment of indebtedness incurred for new construction, extension and permanent improvements, and for future additions to plant.

The Commission defers its approval of the issue of stock for future additions in view of the uncertainty as to the precise amount of the expenditure, setting forth that under ordinary conditions a prosperous company can readily finance such expenditures as needed, and that the approval in advance of additional stock for this purpose is of doubtful expediency.

The Commission has approved the issue by the Worcester Electric Light Company, of 1,000 shares of new capital stock of a par value of $100, at $200 per share. The proceeds of 950 shares are to be applied to the payment of notes outstanding June 30, 1913, and of 50 shares to the payment of obligations on account of additions since that date.

The Commission finds that available earnings in excess of operating expenses, interest and dividends have been ample to provide for expenditures for new plant made during the first six months of 1913. The Company submitted a statement of probable additions to plant amounting to $180,000. The Commission says in its decision that while these expenditures may be needed to meet the public demand, it does not find itself justified in approving an issue of stock for the same in advance of actual expenditure, and says: "The obvious purpose of the restrictive statutory provisions as to the issuance of stock is to limit its amount to the actual needs of the corporation. If, after the proposed expenditure is made, an issue of stock shall be reasonably necessary for the purposes of the corporation, the company may then renew its petition without prejudice from the decision in the present case."

The Commission has approved the issue, by the Greenfield Electric Light & Power Company, of 2,500 shares of capital stock, par value $100, at $100 per share. The proceeds of 1,150 shares are to be applied to the payment of notes outstanding May 31, 1913, and of 1,350 shares to the payment of obligations incurred for additions to plant made subsequent to that date.

The Commission has granted the petition of the Fall River Electric Light Company asking for approval of an issue of capital stock of a par value of $200,000, the price of issue to be $150 per share. The proceeds are to be applied to the payment of notes outstanding June 20, 1913. On January 29, 1913, the Commission approved the issue of 2,000 shares at $150 and required the proceeds to be applied to the reduction of notes outstanding December 31, 1912. The Commission then found that on that date the note indebtedness was $835,000 and that in the three years previous the company spent for additions to plant $643,526. In the six months following, about $200,000 were similarly expended and notes outstanding June 30 amounted to $670,000. Concurrent with the additions referred to, substantial sums have been laid out for reconstruction work at the stations and on the distribution system.

NEW YORK.

The complaint of Patrick McGovern and Company against the New York Edison Company because they were not given the "adequate rate" of 2.5 cents per kilowatt-hour for current supplied to their yard at the foot of East Seventy-sixth Street, where excavated material was brought from Section 9 of the Lexington Avenue Subway, and where cement is mixed for construction work in the subway, has been the occasion for developing another nice point in connection with fixing the prices for electric current in wholesale quantities. At a hearing on July 30th last, Commissioner Milo R. Maltbie stated that while he would not wish to decide offhand as to whether the adequate rate should apply to a yard some distance away from the subway excavation, nevertheless he was very decidedly of the opinion that the mere fact of there being a physical connection between yard and subway by means of a pipe through which air condensed in the yard is conveyed, made no substantial difference, and if because of such connection the Bradley Contracting Company is given the lower rate, the McGovern Company should have it as well. At a recent hearing Robert Ridgway, the engineer in charge of subway construction for the New York Public Service Commission for the First District, submitted a report to the effect that the McGovern yard and the pier are used exclusively for subway work. Thereupon Vice-President John W. Lieb, Jr., announced for the Edison Company that the lower rate of 2.5 cents would be conceded for the McGovern yard, instead of the regular power rates of 8, 6 and 5 cents heretofore paid, and that the company would at once take up the matter of refiguring back bills with Mr. McGovern. Mr. Lieb then went on to say, however, that in the course of their investigation of the subject, the Edison officials had come to have serious doubts as to whether the Bradleys are entitled to the lower rate for their yard, which they maintain for their work on four sections of the same subway. It is specified in their contract that the Edison Company shall furnish all the power used by the Bradleys in the work, but although Edison current is used on one pier, it appears that the Bradleys have another pier which they use in connection with the same work, and which is operated with steam power. When Mr. Lieb explained this grievance of the Edison Company, Mr. Maltbie admitted that the point raised contained interesting possibilities, but he very positively refused to go into it in the proceedings then pending. He remarked that it was clearly a matter for the company to deal with itself although he added with a smile that he had a notion that the Commission might hear more of the matter if the Edison Company should raise the rate on the Bradleys. At the previous hearing, Mr. Lieb had said that it might perhaps make a difference of $5,000 a month to the Bradley Company.

It was mentioned at the hearing that there are other concerns having contracts for subway construction which are in a situation more or less similar to that of the two companies already mentioned.

Edward F. Boyle has been appointed by the Public Service Commission for the First District as special examiner at a salary of $6,000 per annum. Mr. Boyle is a lawyer and accountant, and until recently had been chief of the ex-

ecutive staff in the office of the president of the Board of Alderman.

WASHINGTON.

J. H. Brown has been appointed secretary of the Public Service Commission to succeed F. M. Larned, deceased.

WISCONSIN.

Upon complaint of Janesville Gravel Company, the Wisconsin Commission has investigated the service rendered by the Janesville Electric Company and has ordered the utility to improve its service immediately or suffer prosecution by the attorney-general without further hearing. Similar orders issued by the Commission to the defendant in the past have not been fully complied with and the Commission is determined not to tolerate further non-compliance with its standards of service. The investigation showed that the station equipment was obsolete and inadequate and that many parts of the distribution system were overloaded. Under the provisions of the order, the utility must make regular reports of all interruptions of service, their cause and duration, both to the Commission and to the complainant.

The Commission has acted favorably upon the petition of the Deerfield Telephone Company for an increase in rates but has withdrawn a formal order to this effect until such time as the utility shall have put into effect the standard system of accounting required by the public utility law.

The Commission has taken a hand in the Oconto lighting controversy by prescribing a uniform schedule of rates to be put into effect by the Oconto Electric Company and the People's Land and Manufacturing Company. It appears that the above companies have been engaged in a vigorous and destructive rate war during the progress of which the rates were reduced to such an extent that the petitioner, the People's Land and Manufacturing Company, found its business in jeopardy. In 1911, the Commission made a valuation with a view to a consolidation of the two corporations but no agreement could be reached and both have continued to provide service. The active competition which has been going on for several years has so reduced the resources of both utilities that the circumstances under which they are now operating can hardly be justified by public policy. The rates contained in the order were devised by the Commission with a view to putting to an end the destructive competition existing and will not enable either utility to enjoy a very adequate return upon the investment concerned. The following rates for electric lighting were ordered for both companies:

A service charge of $1.10 gross or $1.00 net per month per active kilowatt of connected load. An energy charge of 6 cents net per kilowatt-hour for the first 30 hours' use per month of the connected load; 4 cents net per kilowatt-hour for the next 60 hours' use of the connected load; an excess rate of 2 cents net for all energy used in excess of 90 hours' use per month. In class A, consisting of residences, the active load is to be taken as 60 per cent of the first 500 watts and 33.3 per cent of the balance. In class B, consisting of all consumers not included in classes A and C, the active load is to be taken as 70 per cent of the first 2.5 kilowatts and 55 per cent of the balance. In class C, consisting of public buildings, churches, halls, hotels, theaters, etc., the active load is to be 55 per cent of the connected load. For some time past neither company has been charging a minimum bill but the order provides for a minimum bill of $1.00 per month.

The power rates include a service charge of $1.00 gross or $0.76 net per active horsepower per month and an energy charge of 2 cents net per kilowatt-hour for current used equal to or less than 25 kilowatt-hours per month per active horsepower connected, with an excess rate of 1.5 cents net. The difference between the gross and net rates is to constitute a discount for prompt payment.

In estimating the active motor load, 90 per cent of the first 10 horsepower is to be taken; 75 per cent of the next 20 horsepower; 60 per cent of the next 30 horsepower; 50 per cent of all connected load in excess of 60 horsepower.

New England Vehicle Section.

Officers for the ensuing year have been elected by the New England Section, Electric Vehicle Association of America, as follows: chairman, J. A. Hunnewell, Lowell, Mass.; vice-chairman, E. S. Mansfield, Boston; secretary-treasurer, Leavitt L. Edgar, Boston; executive committee, Day Baker, Fred M. Kimball, Frank N. Phelps, Howard T. Sands, Frank J. Stone, H. F. Thomson, Albert Weatherby, C. A. White, P. E. Whiting.

Plans for the visit of a delegation of New England representatives of the industry to the annual convention of the Electric Vehicle Association of America at Chicago, were discussed, and the following committee was elected to arrange for the trip: Day Baker, J. S. Codman, O. G. Draper.

Electric Heating Apparatus.

At the meeting of the Pittsburgh Section of the American Institute of Electrical Engineers to be held on October 14, a paper will be presented by H. O Swoboda entitled "The Design, Construction and Operation of Electric Heating Apparatus."

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 165.—Synchronous Motor for Line-Voltage Regulation.—A short time ago I heard of the use of synchronous motors on a transmission line to keep the voltage constant at the receiving end. Is this method dependable and is it much used?—N. P. T., Fort Wayne, Ind.

No. 169.—Electric Meat Curing and Electric Tanning.—I would like to know where to get some information on the electric meat-curing and electric tanning processes.—A. M. B., Toledo, O.

No. 170.—Changing Fan Motor to Lower Frequency.—Is there any way in which an Emerson fan motor now arranged for 104 volts and 16,000 alternations can be made to run on 104 volts and 7,200 alternations?—J. W. K., Niles, O.

No. 171.—Storage-Battery Connectors.—What insulating compound or paint can be used for painting the connectors between cells of a storage battery so as to prevent their corrosion by the acid? I have put glass plates over the cells and this decreases the acid spray, but the connectors still get corroded. They are brass studs with lead-covered nuts. The acid seems to work in between the lead strap and nut.—C. B., Muskegon, Mich.

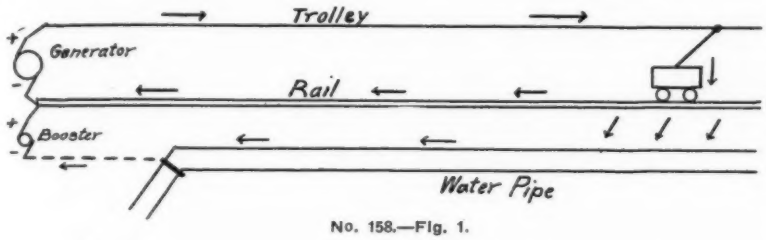
No. 172.—Water Sterilization by Quartz Lamps.—In sterilizing slightly suspicious water by the actinic rays of quartz-tube lamps, about what quantity of water can be treated per hour per kilowatt of energy supplied to the lamps?—F. L. D., Waukegan, Ill.

Answers.

No. 158.—Negative Booster.—What is meant by a negative booster for an electric street railway? Does it lower the voltage when the load is light?—T. N. W., South Bend, Ind.

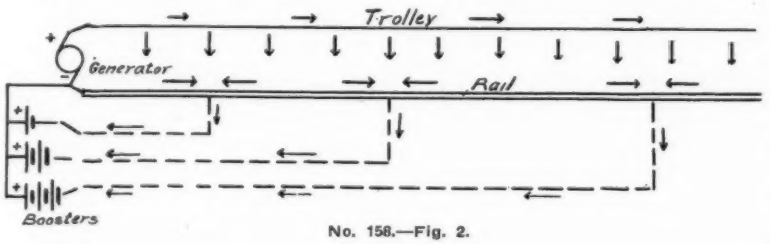
Negative boosters are used in connection with protection against electrolysis to reduce the extent and severity of the action and may consist either of a storage battery or a generator, usually the latter. On account of the expense of installation, maintenance and operation, however, negative boosters are not used to any

great extent at the present time. When metallic underground structures, such as gas mains, water mains or lead-sheathed cables, run parallel to a grounded negative-return direct-current railway system, they frequently pick up "stray current," carry it for varying distances and return it to the railway system at points of lower potential, usually near the generating station. Where the current passes from a pipe or cable sheath to the earth, an electrochemical action, known as electrolytic corrosion, takes place which would eventually result in disintegration of the pipe or cable sheath if steps were not taken to prevent.

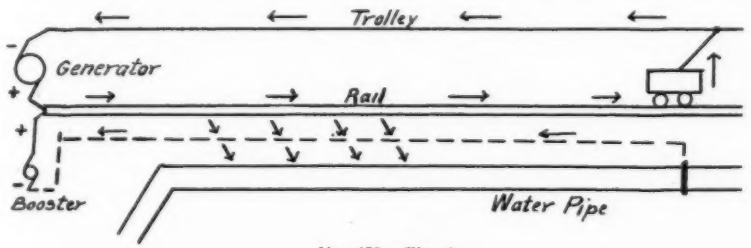


No. 158.—Fig. 1.

The method most commonly used to prevent this action consists in providing a metallic connection or "drainage path" (usually a copper wire or cable) from the underground structure to some point on the trolley system, such as the negative busbar or a negative feeder, over which the stray current may flow instead of passing to the earth. Sufficient current must be removed to lower the potential of the object, which it is desired to protect, below that of the earth, i. e., make it negative to ground. The amount of current drained from the pipe or cable sheath depends, among other things, upon the resistance of the drainage path and the difference of potential between the underground structure to be protected and the point on the electric railway system to which the drainage wire is connected.



No. 158.—Fig. 2.



No. 158.—Fig. 3.

If the drainage connection is of some length, so that the necessary increase in conductivity could be secured only at considerable expense, a negative booster may be used as indicated in Fig. 1, to increase the difference of potential. Such use was more frequent in the past than today, and under modern practice, efforts are generally made to reduce the stray currents, and consequently the extent and severity of the electrolytic exposure, by decreasing the resistance of the rail return by means of careful track bonding or welding the rails together and by installing negative return feeders.

A somewhat similar method is shown in Fig. 2, where, by connecting negative boosters (here shown as storage batteries) in series with negative feeders to distant points, sufficient current is drawn from the rails at such points to diminish the slope of the potential gradient in the rails or even to reverse the direction of flow in certain sections, as indicated in the figure. In either case the stray currents are diminished with a corresponding decrease in the amount of corrosion.

Michalke in his "Stray Currents" states that in Glasgow a number of negative boosters were installed in various substations by means of which the potential difference between feeding points was reduced to less than one volt. Practically all electric railway systems of today are operated with the negative side of the generators to earth, but formerly it was common to employ the reverse method and connect the positive terminals to ground. Under this method the stray current accumulated by metallic underground structure passed to earth and thence to the railway system at varying points depending upon the position of the load at any instant. It was very difficult to take care of electrolytic conditions under this scheme of operation, as it was practically impossible to say where corrosion might be expected to occur. One of the methods employed to prevent such corrosion is shown in Fig. 3, which, it will be noticed is similar to Fig. 1, except that the water main picks up current near the station and delivers it to the drainage connection at distant points. Unless the underground structure to be protected was drained at numerous places quite close together, it was necessary to remove a large amount of current in order that the structure might be negative to earth throughout its length under all positions of the cars. For this reason and the fact that the drainage wires were necessarily of considerable length, adequate protection was secured only at excessive cost, and it was not long before the plan of grounding the positive side of the generators was generally abandoned.

In regard to the query as to whether a negative booster lowers the voltage when the load is light, it may be said that it is not the reverse of a positive booster which is frequently inserted between the positive bus of a station and a positive feeder to some remote locality to raise the voltage in order to compensate for the greater drop due to the greater distance. A negative booster used as indicated in Figs. 1 and 2, however, does reduce the potential drop from the load to the station and accordingly, the energy loss, so that a slightly lower station voltage would suffice for a given load. The effect in this direction would be extremely small in any case and would probably be negligible in a system of any size.—H. S., P., Bloomfield, N. J.

No. 162.—Electroplating Lead and Brass.—Is there any good method for electroplating lead or brass on copper and iron? I should like a formula for the solutions used.—R. H. P., Phildelphia, Pa.

I believe that there is a more promising line of experiment for lead plating on iron or steel than the one given by E. W. in the Electrical Review recently on page 528. The electrolytic refining of lead from solution of lead nitrate has not been successful, largely due, I believe, to the deposition of lead peroxide on the anode, whereby the bath is constantly impoverished, although I note Mathers recently makes the statement that "any soluble lead salt will give a solid, dense coherent electrolytic deposit if the proper addition agents are used" (*Proceedings American Electrochemical Society*, Denver meeting, 1913). However, when it comes right

down to delivering the goods, the only electrolyte which seems to work is a lead-fluosilicate solution, made acid with hydrofluosilicic acid, to which some glue, or other similar colloidal substance has been added. This electrolyte forms the basis of the commercial Betts electrolytic lead-refining process, as practiced at Newcastle-on-Tyne, England; Trail, B. C.; and East Chicago, Ind. It is possible that a royalty might be exacted by Mr. Betts for the working on a large scale of this process, but he would probably welcome and assist any experiments conducted in this line.

An electrolyte which could be recommended for experiment would be: lead, 8.50 per cent; total H_2SiF_6 both combined and free, 11.50 per cent by weight; and about 1 per cent of glue or gelatine. The free hydrofluoric acid should be as low as possible. There should be little trouble in obtaining a solid, dense deposit with 12 to 15 amperes per square foot, using a lead anode. There will be no oxidation at the anode, and anodes may be cast from any scrap lead that is handy. The impurities will remain undissolved on the anode. Almost as much lead will be dissolved as deposits; the bath consequently becomes impoverished with extreme slowness, in fact, there may even be a slightly greater amount of lead dissolved than deposits. The glue under these conditions seems to disappear slowly, perhaps by anodic oxidation.

It may also be noted that Bancroft says "if a lead-acetate solution be made as strongly acid as a lead-fluosilicate solution, glue or gelatine does cause a good deposit." (*Proc. Am. Electrochem. Soc.*, vol. 21, p. 333.) The use of these organic addition agents is apparently the key to successful lead deposition, if he is correct in this statement. Indeed, it seems the key to much other successful electrodeposition, as practically every electrolytic copper refiner seems to think these colloidal addition agents hold up arsenic and antimony and give a tougher deposit than do the solutions without them. They are dispensed with in copper practice when possible, however, as they seem to raise the tank voltage.

It might also be worth while for R. H. P. to try a lead-perchlorate electrolyte. This is covered by United States patent 931,944, issued to Frank C. Mathers (*Engineering and Mining Journal*, p. 1091, June 3, 1911). As described in the European patents of Siemens & Halske (French patent 419,769; German patent 223,668, k.40c., g.12), which I understand are substantially the same, the electrolyte consists of lead perchlorate, free perchloric acid, and a protective colloid, glue, gelatine, etc. (I give the references in the above peculiar way because I happen to have Siemens & Halske's patents, and have not actually seen Mr. Mathers's.) On the above basis, it would appear that either hydrofluosilicate, acetate, or perchlorate electrolytes offer greater hope to the lead plater than does lead nitrate.—D. M. L., Elizabeth, N. J.

No. 164.—Life of Dry Cell.—What is the longest life record of a standard dry cell used for intermittent or open-circuit work?—J. S., Hinsdale, Ill.

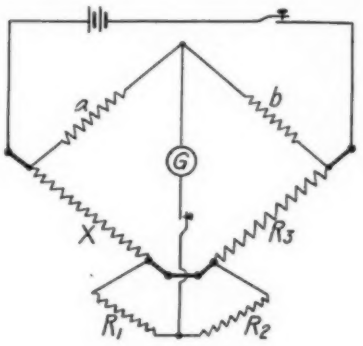
The best performances of dry cells that we know of are the following: J. A. Miller, manager of the Miller Telephone Company, Fruitdale, Ala., on September 14th, 1911, replaced a set of Columbia batteries that had been installed March 2, 1907, and had been in continuous use since that time. A. J. Osborn, superintendent of switchboards, Missouri Union Telephone Company, Clinton, Mo., says that he recently took out a set of Columbia cells that had been in continuous use for more than five years on a rural party line, on which the service, he says, is particularly severe.—V. A. C., Cleveland, O.

This question is one that really had no standard answer, owing to the fact that batteries are called upon to do all kinds of work, in some cases only being pressed into service to operate, say, relays, or some other piece of small apparatus, and being in circuit only a few seconds, or, on the other hand, possibly to run a window tapper, which is a steady strain on the battery. In the first cases cited, I will say that batteries have been known to stand up for months, perhaps a year, and even at that under conditions that were unfavorable, in a damp place. In pocket flashlights the rule seems to remain about the same. As to the record for long life, I can but say that I recently removed four dry batteries from a long unused gas-lighting system and the factory date stamp was 1907 and of the four cells two showed eight amperes on test. So after six years from date of manufacture, and two years of lying idle, there was still life in these two, a fairly good case to cite for J. S.—W. E. R., Boston, Mass.

The longest period of service given by dry cells that I know of was with two Columbia No. 6 cells installed in a bridging (Kellogg) telephone. The line was about 20 miles long and had 16 telephones. The batteries were installed January 20, 1907 and became exhausted August 29, 1909, making 2 years, 7 months and 9 days of actual service.—H. L. M., Blandinsville, Ill.

No. 167.—Thomson Double Bridge.—Please explain through your Questions and Answers department the Thomson double-bridge method of measuring and checking resistances, and give description and diagram of the bridge used.—H. M., Blandinsville, Ill.

The Thomson (Kelvin) double bridge is a modified form of Wheatstone bridge and is used for measuring very small resistances, such as ammeter or wattmeter shunts. It eliminates the error due to connections and connecting wires that are included as part of the unknown resistance in using the simple form of bridge. The diagram of connections of the Thomson double bridge is shown in Fig. 1. The battery electromotive force need not be known, nor need it be constant; a, b, R_1 and R_2 are acurately known resistances; R_3 is a known resistance whose value can be readily changed; X is the



No. 167.—Fig. 1.

unknown resistance to whose potential points the ratio arms a and R_1 are connected. In measuring with this bridge the ratio a/b must be made the same as the ratio R_1/R_2. When balanced the point between R_1 and R_2 will then have the same potential as a point on the connecting bar between X and R_3. Assume the resistance from X to this point to be c and from R_3 to the same point to be d. Then

$$c/d = R_1/R_2$$

and we can imagine the galvanometer connected directly to this point between X and R_3. When balanced, we have

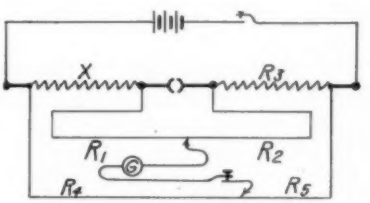
$$a/b = (X + c)/(R_3 + d)$$

but $a/b = c/d$

therefore $X/R_3 = a/b$

or $X = aR_3/b$

The ratio is changed for large and rough adjustment and R_3 is changed for fine adjustment.



No. 167.—Fig. 2.

Another form of this bridge is shown in Fig. 2 in which parallel slide wires of the same length are used for R_1, R_2 and R_4, R_5; R_3 may be a fixed standard resistance. The ratio R_1/R_2 must equal R_4/R_5. A balance is obtained with the connection between X and R_3 both open and closed. Then

$$X = R_3R_4/R_5 = R_3R_1/R_2,$$

the principle being identically the same as before.—F. D. K., Syracuse, N. Y.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION.

Annual Convention at Glenwood Springs, September 25-27.

The annual meeting of the Colorado Electric Light, Power and Railway Association was held at Glenwood Springs, September 25, 26 and 27, at the Hotel Colorado. The convention brought out the largest attendance in the history of the Association and the many excellent papers read developed a great deal of new interest. Two special cars were run from Denver, and every section of the state had a good representation. There were many entertainment features, which were arranged by R. Arnold Lewis, B. S. Manuel and H. C. Biglin. There was a good contingent of ladies present and many card parties were held during the days of the convention.

A decided effort will be made this year to broaden the scope of the association, with a view to doing everything possible to develop new industries and electric pumping, so that a great many thousand acres of land can be brought under cultivation.

W. C. Sterne, the newly elected president, began his campaign along this line before the convention came to a close, and has already stirred up much enthusiasm among the members. "I believe we should be able to double our membership this coming year," he said, "and if we can do that, I am positive we shall be able to produce twice the results we have heretofore. A great deal of good work can be done by our association, because we are in a virgin territory and the possibilities for building up the loads of the various central stations are almost limitless.

"We are going to make a special effort to bring in to the Association every small central station in the Rocky Mountain region so that they may receive the benefit of the wider experience of the larger companies of this section. Small companies are somewhat handicapped in that their limited income preclude the maintaining of special departments, such as engineering, accounting, new business, etc., which are parts of the larger systems.

"Different sections of this state are particularly adapted to various forms of development. For instance, central stations have an abundance of underflow that permits of extensive irrigation by means of pumping; other sections, prolific in alfalfa, are adapted for the installation of alfalfa meal mills, etc. The economical power for such is electricity. With proper stimulus, new industries could be started and much land made producing. The Association believes that such stimulus could be given by the appointment of representative central stations now in various portions of Colorado, to specialize in the features to which their localities may be peculiarly adapted, and with whom other central-station men in that territory could easily come into touch.

"To bring into the Association all local jobbers, manufacturers' sales agents and retail men identified with the electrical business, in order that in so far as possible, supplies may be purchased locally. These men, covering all sections of the Rocky Mountain region, come into touch with the needs of the various sections and by calling same to the attention of the Association, may be possible to interest capital for such development.

"The Association is composed of men allied with street railway, electric light and power, and kindred industries. Its aim is to widen the use of electricity in its various forms. Its members come from all parts of the Rocky Mountain region and are all men who are potent forces in the upbuilding of the communities in which they reside.

W. C. Sterne,
President-elect of the Colorado Association.

"During the coming year the Association will endeavor to still further unify and centralize its efforts along lines that will not only broaden the business of its members, but also work for the general upbuilding of the state."

Papers were read as follows:

"Industrial Motor Applications," by W. H. Bullock, Westinghouse Electric & Manufacturing Company. "Simplified Accounting for Public-Utility Corporations," by A. E. Ward, Northern Colorado Power Company. "Lightning Arresters," by B. C. J. Wheatlake, General Electric Company. "Joint-Pole Usage," by Charles Neely, Arkansas Valley Railway, Light & Power Company. "Relation of the Incandescent Lamp to Lighting Service," by R. E. Campbell, National Electric Lamp Association. "The Central Station Off-Peak—Its Remedy," by Melcher Ekstromer, General Motors Truck Company. "The Central Station in the Small Town," by H. L. Titus, Sterling Consolidated Light & Power Company. "The Use of the Single-Phase Motor from the Central-Station Standpoint," by W. A. Layman, Wagner Electric Manufacturing Company.

The papers were highly interesting and were fully discussed. Those by Messrs. Ward and Ekstromer are abstracted below. The paper by Mr. Titus will be found on other pages of this issue.

The Off-Peak Load.

The development of the central station was briefly traced from the time when it furnished current for lighting only and had a load-factor of perhaps five per cent, through the development of the power load to the present conditions of 24-hour operation, with units of high efficiency and better load-factor. Even when a large motor load has been obtained, however, it is seldom that it is carried more than 12 hours per day, and after midnight both motor and lighting loads are usually lacking. From midnight until 5 a. m. there is a valley in the load curve which should, if possible, be filled. The object of the paper was to point out a means of equalizing the load curve through the night charging of electric-vehicle batteries. It was pointed out that much hauling can be done more cheaply by electric trucks than by horse-drawn wagons and figures were given indicating the great amount of trucking necessitated by our enormous railroad traffic. The electric truck of today is a machinery unit designed and perfected to do a definite amount of work and can be built to do it in a definite time and at a certain cost. He pointed out that accurate engineering is now being applied to this problem and the performances of batteries and motors are recorded by electrical measuring instruments. It is thus possible to determine costs accurately. He then referred to the investigation carried out at the Massachusetts Institute of Technology regarding the comparative performances and cost of electric, gasoline and horse-drawn trucks, the results of which exhaustive investigations showed that the electric gives a marked economy over all other types of self-propelling vehicles, as well as horse-drawn wagons. He then referred to the parts which the manufacturer and central-station man should play in developing a vehicle load. Their interests are closely allied and they should co-operate in this problem. The selling agent should seek out the prospects, investigate the requirements and conditions and put forth his best efforts to effect a sale. The central station should educate its customers as to the advantages of the electric truck by advertising and other publicity and by installing electric trucks of its own. It should also maintain a department of storage-battery and vehicle engineering in charge of a competent, technical and practical man, and either establish a public charging station or see that someone else does so.

Simplified Accounting.

This describes a system inaugurated by H. U. Wallace and the author of the Northern Colorado Power Company, which has headquarters at Boulder and operates in a number of towns in the surrounding territory. It is based upon the use of adding machines, cash registers and other mechanical devices. Formerly each local office was running independently so far as accounting was concerned, but this was found uneconomical and the accounting is now cen-

tralized, meter readings and billing being distributed through the month. A number of special machines were constructed; one being an addressograph; one a machine for making out bills; one a duplex adding machine and several special cash registers. Billing is done in quadruplicate, one card being retained in the central office; one card being sent to the customer and the other two used in the local office. The details of the method followed are given. The addressograph prints name, address and date upon the four cards simultaneously, and an automatic machine makes out the bills and stamps the amounts on the cards. Meter books are sent to the central office and provision made for skipped readings. New connections and disconnections are also provided for. Receipting of bills in the local offices is done upon a register which prints the amount and adds up the total. Cash and charge sales of merchandise are similarly registered on duplicate sales books. Bank deposit slips are similarly printed upon a register in duplicate and one copy sent to the central office. One of the great advantages claimed for the system is that the main office receives duplicate records printed upon a register so there can be no discrepancy between these values and those used in the local office or handed to a customer. The apparatus used in this system cost about $4,000 and is expected to pay for itself in two years; simultaneously, to safeguard the company's interests, it provides a mechanical check upon all business transacted in each town and all cash received and paid out at the main office. A system of store-room records has been devised which involves daily reports to the main office of all merchandise sales, lamp exchanges, materials used in construction work and maintenance of property. Monthly inventories are also made. The time-keeping has also been placed upon a daily-report basis.

The election of officers resulted as follows:

President: W. C. Sterne, The Summit County Power Company, Denver.

Vice-President: W. F. Raber, Arkansas Valley Railway, Light & Power Company, Pueblo.

Secretary-Treasurer: T. F. Kennedy, Denver Gas & Electric Light Company.

Executive Committee: W. J. Barker, Denver; H. U. Wallace, Boulder; L. P. Hammond, Denver; W. F. Raber and W. C. Sterne.

Advisory Committee: J. F. Dostal, Colorado Springs; H. L. Corbett, Georgetown; J. A. Clay, Durango; F. P. Wood, Trinidad; H. L. Titus, Sterling.

Finance Committee: W. G. Matthews, Denver; C. S. Flower, Montrose; S. M. L. Spadden, Grand Junction.

Membership Committee: J. M. Connelly, W. H. Horton, E. L. Siekmann, all of Denver.

Among improvements to be carried out soon on the harbor of Newcastle, N. S. W., Australia, is the building of an electric power plant to supply new coal-loading machinery and also the tramway system when it is electrified.

THE BIRMINGHAM MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

By John B. C. Kershaw.

The eighty-third annual meeting of this Association which was held at Birmingham, England, from September 10 to 17, was one of the most successful of recent years, the attendance of members and associates reaching a total of over 2,600, and the interest in the papers and discussions being well maintained in all the twelve sections into which the association is now divided.

The Presidential Address of Sir Oliver Lodge on "Continuity" has been more widely noticed and discussed in the public press of the country than any address since Professor Tyndall's noteworthy one of 1874, and these two addresses may be regarded as marking the two extremes to which the pendulum of scientific thought has swung—in the period 1874-1913.

It is, of course, impossible within the limits of this report to give any lengthy abstract of the president's remarks, but the following summary of his argument will indicate the lines of thought that permeated the address.

A marked feature of the recent scientific era was the discovery of, and interest in, various kinds of "Atomism", so that "Continuity" seems in danger of being lost sight of. Another tendency was towards comprehensive negative generalizations from a limited point of view. Another was to take refuge in rather vague forms of statement, and to shrink from closer examination of the puzzling and the obscure. Another was to deny the existence of anything which makes no appeal to organs of sense, and no ready response to laboratory experiment.

Against these tendencies the president contended. He urged a belief in ultimate *continuity* as essential to science; he regarded scientific concentration as an inadequate basis for philosophic generalization; he believed that obscure phenomena might be expressed simply if properly faced; and he pointed out that the non-appearance of anything perfectly uniform and omnipresent was only what should be expected, and was no argument against its real substantial existence.

The proceedings in the section devoted to engineering were opened on Thursday, September 11, by an address from Prof. Gisbert Kapp, formerly of Berlin, but now head of the Electrical Engineering Department of the Mason Science College at Birmingham. His address was a review of the advances made during the last 30 years in the applications of electricity to the problems of suburban and main-line traction, and of the great success that has attended the electrification of railways in England and other countries. Details of all the more important schemes of electric traction were given, including figures hitherto unpublished relating to the electrification of the St. Gothard tunnel on the main lines of railway between Germany and Italy. This address was packed with facts and figures that will prove valuable to electrical engineers engaged in this branch of engineering, and a copy of it should be kept on their shelves for reference purposes.

Turning now to a consideration of the other papers read and discussed in Section G, likely to prove of interest or value to readers of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, the following may be noticed.

"Solid, Liquid and Gaseous Fuel," by Professor Burstall, of Birmingham University, started with a general introduction discussing the various prime movers for generating power and their defects; the author considered the relative amounts of the various types of solid and liquid fuel available for this purpose. The annual output of solid coal by the mines of the whole world was stated to be about 1,200,000,000 tons; while that of crude oil was estimated at 50,000,000 tons. Since it was doubtful if any large oil fields remain undiscovered, it followed that the supply of oil was totally inadequate to replace the solid fuel used for power production. The artificial production of oil fuel ought therefore now to be considered seriously.

Up to the present, coal has been gasified with the idea of producing the highest yield of gas, but it was quite possible to alter the conditions of carbonization so as to obtain a higher yield of fuel oils and other compounds of value including sulphate of ammonia. A large proportion of the nitrogen was also now wasted, owing to the crude methods of burning the fuel. By the present methods of gasification a modern gas-works produced 11,500 to 12,500 cubic feet of gas with a calorific value of 530 British thermal units per cubic foot, 10 gallons of tar, and 25 to 30 pounds of ammonia sulphate. A good gas engine and dynamo would give one kilowatt-hour for 20 cubic feet of gas, or one kilowatt-hour at a cost of 0.4 cent for the fuel. This is, of course, high.

This author is of opinion that the future of fuel treatment in Great Britain lies in its decomposition in closed retorts, under conditions which make the yield of a standard illuminating gas the secondary consideration, and the yield of by-products the chief one.

It has been long known that the quantity and quality of the tar is largely influenced by the temperature at which the fuel is carbonized, the lower the temperature the better being the yield and

composition of the tars. If the gas and tars are withdrawn from the retort and zone of heat, immediately they are evolved, many of the tar oils after distillation can be employed as fuel oils. These tar oils will yield benzol, light oils of the pentane-hexane series, middle oils such as crysilic acid, and heavy oils of the anthracene series.

The author then sketched out the details of a large scheme of this kind for treating coal at the pit's mouth, the carbonization units of this scheme being of 2,000 tons capacity each per day. The tar and gas would be taken by pipe lines to suitable points for their further treatment, the tar being subjected to fractional distillation in continuous automatically worked stills, in order to obtain the various light and middle oils from it, before sale of the residue for fuel. Such a works would produce from 120,000 to 140,000 gallons of tar per day, and the recovery of by-products from this tar would vary, according to the market price of the various oils. The gas itself would not be purified from sulphur, but would be used in its crude state in 2,000-horsepower gas engines for the generation of electricity. The exhaust gases from these gas engines could then be treated for their sulphur contents, which thus would be recovered as ammonium sulphate.

The author admitted that at present the scheme was visionary but he quite hoped to see it realized within a reasonable time.

"A New Method of Sealing Electrical Conductors Through Glass," by John S. Anderson, described a method devised by G. B. Burnside which consists essentially in fusing the metal and glass together in the usual way and then immersing the seal, after it has cooled to about a red heat, in a bath of oil or fat. Each immersion lasts about two or three seconds. The seal is immersed a little further in the cooling medium at each successive immersion, until it is completely cooled.

For currents up to 15 amperes solid conductors may be employed, but for larger currents it is found advisable to make use of tubular conductors, which may be quite easily sealed through glass, according to Mr. Burnside's method.

In the preliminary experiments, copper wires 1.5 millimeters in diameter were successfully sealed through German glass, and platinum wires of 1 millimeter diameter were sealed through Jena and other glasses. A copper tube, capable of carrying a current of 100 amperes, was sealed through German glass. Platinum wires were sealed through Jena glass in mercury-vapor lamps, and the seals were found to be air-tight after a period of over eight months, although they had from time to time been subjected to the heat of the lamps when burning.

The chief advantages of this method of sealing electrical conductors through glass are as follows: (1) the process of obtaining seals is much simpler than any at present in use; (2) for incandescent electric lamps and all kinds of vacuum tubes, with the exception of mercury-vapor apparatus, copper or other high-conductivity metal may be used as the conducting material; (3) in the case of mercury-vapor apparatus, a minimum quantity of platinum is used in the tubular form of conductor for large electrical currents, because the tubular shell may be filled in with copper, subsequent to the sealing process; (4) conductors of very much greater cross-section than it has hitherto been possible to employ may be sealed through glass; (5) the one process is applicable to all kinds of glasses.

"A New Method of Starting a Mercury-Vapor Lamp," by John S. Anderson.—In the best types of mercury lamps and rectifiers at present on the market, the arc is started by tilting the lamp or rectifier, either by hand or automatically. This tilting arrangement is very often inconvenient, especially in the case when one is dealing with lamps used for scientific purposes.

G. B. Burnside and the author have overcome this difficulty by constructing a lamp which may be fixed in position between the poles of an electromagnet, or in any other suitable position, and then started without having to be tilted. This is brought about by the employment of a heating arrangement near one of the electrodes, preferably the negative electrode. The lamp tube is provided with a small vessel near this electrode, the vessel having a re-entrant portion or recess in which a heating element is placed. The part of the tube immediately above this small vessel and its recess is constricted. The heating element may conveniently consist of a small coil of platinum wire wound round a suitable support; it may be placed in the recess of the small vessel or removed at will, without interfering with the vacuum of the lamp. The heating coil of wire is connected in series or in shunt, in the latter case being provided with an automatic cutout. An external resistance is placed in series with the lamp. Before starting, the small vessel is full of mercury, which forms a continuous connection inside the tube between the positive and negative electrodes. When the electrical current is switched on, the heating coil becomes incandescent, and the heat given off by the wire goes to raise the temperature of the vessel and its contained mercury, there being no appreciable loss by radiation into the surrounding air. Very little heat is required, because the first bubble of mercury vapor formed, rises to the constricted portion of the lamp and is there caught, thus breaking the continuity of the mercury inside the lamp, and starting the arc. Owing to the resistance of the mercury vapor which is formed once the arc is started, the current is cut down to the value required for running the lamp. The platinum wire of the heating element can be made of such a thickness, and the external resistance can be so adjusted, that the wire does not emit heat when the lamp is working, but becomes incandescent when the lamp is started, the action being quite automatic.

"A Direct Method of Measuring Magnetic Susceptibility," by W. H. F. Murdoch.—The author uses a unipoplar method of testing, with addition of a circular coil in series with the magnetizing solenoid. This coil acts upon the magnetometer needle which is lying in a neutral field of force, so that the tangent of the resulting deflection due to the magnetic material, plus coil, is strictly proportional to the magnetic susceptibility.

A mirror may be used to read the deflections, and in this case susceptibility is proportional to deflection.

It follows that such an instrument with tangent scale and pointer can be graduated so as to read directly the value of the susceptibility coefficient, in C. G. S. units. To fix the value of magnetizing field, the current is measured and the value multiplied by a constant.

The theory of the instrument was given, and an example of its use for testing iron, together with a diagram of connections and curve of results. The various corrections were also briefly discussed.

"The Nature of the Electromagnetic Waves Employed in Radiotelegraphy, and the Mode of Their Propagation," by G. W. O. Howe, gave a very clear conception of the nature of the electromagnetic waves employed in radiotelegraphy by considering those electromagnetic waves which exist in the space between the two conductors of a single-phase transmission line. If the conductors are flat parallel strips, close together, and are connected at the sending end to the terminals of an alternator, there is a certain value of the non-inductive load at the receiving end, which will absorb the arriving energy without any reflection. Under these conditions the current and voltage are in phase all along the line, and the same is true if the line is assumed to be of infinite length. Line resistance and leakage are assumed to be negligible. It follows from this that the electric and magnetic fields at any point have their maximum values at the same moment. Instead of two parallel strips transmitting energy in one direction, two parallel disks of infinite extent can be imagined, with the alternating voltage applied between their centers. Energy would then be transmitted radially in all directions in the plane between the disks. The earth could

take the place of the lower disk, while the upper one could be represented by a conducting horizontal plane some distance above the earth. The waves produced would be truly cylindrical, whereas those employed in radiotelegraphy are spherical. If, now, the upper disk is replaced by an inverted conducting cone of infinite extent, with its apex almost in contact with the earth, the alternating voltage being applied between the apex and the earth, the electromagnetic waves will be almost identical with those employed in radiotelegraphy and will vary in the same way with the distance from the sending station. This imaginary multidirectional transmission line, consisting of a lower plate (the earth) and an inverted cone, leads itself to simple calculation, because like an ordinary transmission line, and unlike the two parallel disks, it has a constant inductance and capacity, per mile. It can be shown that if the angle between the cone and the earth is 70 degrees, the relations between the magnetic and electric fields near the earth's surface, and the total energy radiated are identical with those existing in the ordinary radiotelegraphic waves. As in the transmission line already considered, the current and voltage will be in phase at every point, and therefore contrary to the usually accepted view, the horizontal magnetic field and the vertical electric field due to a sending antenna are not 90 degrees out of phase, but are approximately in phase, except in the immediate neighborhood of the antenna. This also follows from the fundamental equations of a progressive, as distinct from a stationary, electromagnetic wave.

"Some Effect of Atmospheric Conditions on Wireless Signals," by E. W. Marchant, dealt with the diurnal variations in the strength of the signals received at Liverpool from Paris, over a considerable period of time; the figures given in the paper, however, were obtained mainly from the observations made in July, 1913. The most accurate observations have been obtained with signals sent out by the observatory at the Eiffel Tower at 10:45 a. m. and at 11:45 p. m. The method adopted in the earlier tests was to use a Perikon detector in series with galvanometer and telephones, the measurements of strength being made by the cumulative deflection due to a series of known signals. This method was not found satisfactory with the Paris signals for which the antenna current used was known, and in the latter tests an Einthoven string galvanometer has been employed, by which the strength of signal for each individual spark at Paris, could be observed to within 5 per cent. The results obtained show that there is a maximum variation from 0.3 to 1.3 in the strength of the signals received, on different days in the same month, the average strength of signal being assumed to be 1.1, and that the current received on a fine, clear night is about 1.7 times as strong as that received in the daytime.

Although no certain relationship can yet be regarded as established between the strength of a signal and the weather conditions at the sending and receiving stations, so far observation has shown that rain in Paris always corresponds with a diminution in strength of the received signal. In one case, with a wind of six meters per second velocity, blowing in a northwesterly direction, the signal strength fell to half its normal value. The most favorable condition for signalling appears to be a cloudy sky at both sending and receiving stations, the signals being weaker when the sky is clear or is only covered with light clouds. Rain at the receiving station appears to have a comparatively small influence on the strength of the received signals.

The result of a set of special signals sent from the Eiffel Tower on the evening of Saturday, July 26, 1913, at intervals of 30 minutes, between 7 and 10 p. m. (which includes the time of sunset), shows that the increase in the strength of night signals occurs, just after sunset, there being a sudden increase in strength of about 70 per cent. This change is quite sudden, there being comparatively little alteration in signal strength until the sun has set; and there is no perceptible increase in strength afterwards. There appears to be some evidence, however, that signals are slightly stronger just after sunset, than during normal night conditions.

"Note on the Friction Losses in Steam Pipes," by C. H. Lander.—The loss of pressure in a steam pipe is usually estimated by an expression of the form

$$p_1 - p_2 = 4 f l v^2 / 2 g d$$

in which different values of the constant f are used for different diameters of pipes. More accurate determinations referring to the flow of fluids carried out under more general conditions have shown that the exponent of the velocity is less than 2 and in the neighborhood of 1.8.

A series of experiments has been carried out on a pipe 0.75 inches internal diameter and 75 feet long; the pressure drop, the heat lost through the walls, the velocity of flow, etc., were measured. The velocities were varied from 30 to 200 feet per second, and the initial pressures from 9 to 215 pounds absolute.

The results can be represented with considerable accuracy by

$$p_1^{1.94} - p_2^{1.94} = 77.4\, w^{1.82}$$

for the particular steel tube used, the pressures being in pounds per square inch, and w being the weight of flow in pounds per minute.

The experimental work is still in progress, and the effect of diameter is being investigated.

"Lightning and Protection From It," by Sir Joseph Larmor, stated that the tendency of the lightning flash was always to follow the line of force, or the path of the abrupt discharge. A lightning conductor only protected a building by giving a path for this abrupt discharge, when and if it occurred, and it was not the conductor but the building itself, which attracted and caused this discharge.

"Domestic Electric Cooking and Heating; the Results of One Year's Working," by J. T. Morris.—The author of this paper gave figures, derived from actual experience, of the cost of running an electric cooking installation in London from July 27, 1912, to July 26, 1913. The details of the kitchen were as follows:

The arrangements used for cooking were a Jackson (Marlebone) electric cooker, having three hot plates, two for boiling and one of lower heat for simmering purposes, one grill, and a fair-sized oven, the approximate measurements being: height 38 inches, width 30 inches, depth 24 inches. The hot-water supply was obtained by means of a coke boiler. It requires lighting in the morning, and stoking two or three times a day with coke, and it will burn practically any kind of rubbish. This is a matter which should not be lost sight of, for if all coal fires are done away with in a house, difficulties arise with regard to disposing of certan forms of rubbish.

A table is given showing the energy used per day, for cooking required by five or six persons, for a period of ten months. The total varies between 5 and 15 kilowatt-hours, according to the quantity of cooking required. The average daily consumption over the whole period is 9.75 units, which at one cent per unit, amounts to an expenditure of 9.75 cents per day. Over this same period of ten months, six chaldrons of coke, $21.82, were used for the hot-water supply. This, with the cost of the necessary wood for lighting the stove, equals an expenditure of 8 cents per day.

The figures were obtained in a flat having six rooms, a kitchen and a bathroom, and represent the consumption for a household of five persons. It should be noted that in one room a coal fire was used for part of the period, and therefore the figures for heating are smaller than they would otherwise have been. Further, it should be remarked that there are no gas pipes in the flat. The maximum weekly consumption for heating is 129 kilowatt-hours.

With reference to the lighting, the maximum weekly consumption was 6.5 units, which at one cent per unit, makes 6.5 cents per week. It is interesting to note that this amount is insignificant in comparison with the amount due to the annual charge, but it should be remembered that this annual charge covers all

uses of electricity, though based on the maximum lighting load.

The individual charges which go to make up the total expenditure throughout the year on cooking, heating and lighting are:

Annual Demand charge	$31.36
Hire of Cooker	14.40
Cooking: 2,934 units at 1 cent	29.34
Heating: 2,068 units	20.63
Lighting: 200 units	2.00
	$97.78
Coke and Wood	$21.82
	$119.60

In comparing this method of heating and cooking with methods in which coal is used, it must be borne in mind that a saving of from $120 to $144 has been made in the cost of domestic service, and therefore on the above tariff, it is an indisputable fact that a considerable gain has been made on the score of economy, cleanliness and independence.

Experience gained with this electric cooker has suggested the following as some of the directions in which improvements would be specially welcome. (1) At present a rather serious obstacle in the way of reheating dishes—a common every-day need in most households—is the relatively long time taken in bringing the oven to the working temperature, and consequently the disproportionately large expenditure of energy to effect a comparatively trifling result.

(2) The time taken to boil a pint of water, especially the first one in the morning when the cooker is quite cold, might be somewhat shortened with considerable advantage.

(3) Cooking utensils, however perfectly flat-bottomed they may be when first supplied, appear, with ordinary wear and tears, too soon to lose this quality, so necessary for economy both in time and energy used.

Dixon Inaugurates White Way.

On September 17 the people of Dixon, Ill., celebrated the inauguration of a "Great White Way" in that city. Forty new ornamental inverted luminous arc lamps of the four-ampere type were installed 100 feet apart on the steel trolley poles, 18 feet above the street level. This is the first installation of this kind of ornamental lighting in the towns of Illinois and it has attracted a great deal of attention. A photograph of the first four blocks looking west along First Street is reproduced herewith.

The new lighting was arranged by the Citizens' Association, which, upon the evening in question, formerly presented it to the city. Mayor Britton made a reply to the presentation and addresses were also made by Mayor Platt, of Sterling, and Mayor Stanley, of Rock Falls. These twin cities contemplate ornamental lighting also.

White Way in Dixon, Ill.

The lamps hang from ornamental brackets weighing 300 pounds and are connected on a series circuit. The cost of the installation was paid for by merchants and property owners. Energy and maintenance will be paid for by the city at the rate of $47 per lamp per year. The lamps will burn from dusk until 11 o'clock, except on Saturday nights, when they will remain lighted until midnight.

The business men of Dixon were so well pleased with this installation that an additional subscription was raised two days later to add 27 more lamps to the installation. This is a remarkable showing for a town with a population of 7,200. Dixon is now paying $2.00 per capita per annum for street lighting.

Current for the new installation will be supplied by the Illinois Northern Utilities Company, of which Charles B. Youts is general contract agent.

Safety at Sea.

Secretary of Commerce Redfield's Committee on Radiotelegraphy, to prepare recommendations for the use of the American delegation to the International Conference on Safety at Sea, to be held in London, November 12, has made its report. The committee recommends:

(1) That efficient apparatus for radio communication be required on all ships in foreign trade which carry 50 persons or more (passengers or crew, or both combined), navigating the ocean between ports more than 200 nautical miles distant from one another.

(2) That apparatus, to be deemed efficient, must transmit messages with sufficient power to be received by day over sea at a distance of at least 100 nautical miles by a ship equipped with apparatus equal to that of the transmitting ship.

(3) That an auxiliary power supply should be provided, independent of the vessel's main electric power plant, which will enable the sending set for at least four hours to send messages over a distance of at least 100 nautical miles by day.

(4) That two first-grade operators should be required on all such ships maintaining a constant service, also on all such ships carrying 100 or more passengers. One first-grade and another first or second-grade operator should be required on all other such passenger ships. One operator (first or second-grade) and one cargo operator or watcher should be required on all such cargo boats.

The recommendations of the committee are based not only on the laws of the United States but also in principle on the London International Convention and the laws of Canada and Australia. The laws of Canada and Australia do not specifically require a constant wireless watch on cargo boats, but authorize those colonies to impose that requirement.

The second operator or watcher on a cargo boat will rarely be required for the safety of his ship or the crew of which he is a member. The constant watch is to be maintained almost entirely for the purpose of enabling the master of the cargo boat to be at all times in a position to receive radio distress calls and to render the assistance within his power. The proposition, accordingly, is in the interests of the safety of the seafaring world.

The committee comprised E. T. Chamberlain, commissioner of navigation, chairman; W. H. G. Bullard, superintendent Naval Radio Service; C. M. Saltzman, assistant to Chief Signal Officer; J. Q. Walton, constructor in the Revenue-Cutter Service; Frederick A. Kolster, Bureau of Standards.

Pittsfield Plant of General Electric Company Publishes "Safety" Information for Employees.

A weekly newspaper, *Current News*, is being issued at the Pittsfield, Mass., plant of the General Electric Company, the primary object of which is to instill into the minds of the employees the need of care in operating the various machines, to the end that accidents may be reduced to the minimum. The paper is written and printed at the plant and 6,000 copies are distributed to the workmen, many of them going into the homes of the employees, where they interest the women and children in the purposes for which the publication is issued.

The *Current News* contains items of general interest incident to the conduct of the work, besides the words of caution and accident prevention. Methods of first aid and a description of the best mode of resuscitating a person suffering from electric shock are also included in the pamphlet.

To meet the inevitable emergencies that occur in the great plant, the General Electric Company maintains a hospital with an operating room, and an experienced attendant in charge. Only the more serious accident cases are sent to the public hospital.

Boosting Electrics in England.

Following upon the decision reached at the last summer meeting of the Incorporated Municipal Electrical Association, that an electric-vehicle "forward movement" should be set on foot in England, a committee has now been appointed with R. A. Chattock, city electrical engineer of Birmingham, as chairman, and F. Ayton, borough electrical engineer of Ipswich, as secretary. The committee includes both municipal and private-ownership central-station men, manufacturers of storage batteries and battery vehicles, and representatives of the automobile associations. Its prime duty is to consider and adopt such measures as may be found desirable to further the use of electrics. The program that it has set for itself indicates the thoroughness with which the matter is to be pursued. First it will impress on central-station authorities the desirability of taking energetic steps to encourage the use of electrics by (1) agreeing to supply energy for charging purposes at a reasonable price; (2), calling meetings of motor-car dealers and hotel proprietors in order to induce them to provide charging facilities; (3), at the outset giving assistance to motor-car dealers when they may be confronted with difficulties in connection with electrics; (4), advertising the whereabouts of charging stations at all main road entrances to each town; (5), impressing upon municipal bodies and others employing means of transport in their respective areas, the advantages attending the use of the electric vehicle; (6), distributing information and literature among likely users, also probably compiling literature; (7), providing charging oufits for rent.

The second part of the Committee's work will be to decide upon the best arrangements to recommend for charging; to decide upon the most suitable sizes of a line of charging outfits (1) for direct-current systems, (2) for alternating-current systems, which, in order to eventually reduce cost of manufacture could be recommended as standard sizes; and to secure, as far as possible, simplicity, clearness and uniformity in battery-charging instructions.

Rules will be considered for the proper use and maintenance of electrics, and the standardization of the technical details connected with their design will be reported upon. These technical details will comprise ratings for motors, voltages, carrying capacity and speeds for commercial vehicles, wiring, charging terminals, battery units, and also electric lighting of vehicles.

Insurance companies will be approached with a view to inducing them to quote specially favorable rates for insuring electric vehicles in consequence of the reduced fire risk, etc. If possible, periodical parades and exhibitions of electrics will be arranged. Useful information will be collated and published, and authorities will be approached concerning the assessment of electric vehicles for taxation purposes. The issue of maps with charging stations indicated, also a list of tariffs, is among the intentions of the committee.

Rejuvenation of Philadelphia Jovians.

Philadelphia Jovians have arranged to hold a rejuvenation on the evening of October 13, immediately preceding the annual convention in New York City, which opens on October 14.

Dinner will be served at the Continental Hotel at 6:30 p. m., the subscription being $2.00 per plate.

The Degree Team of the National Carbon Company, of Cleveland, will conduct the initiation upon this occasion, which insures an interesting evening to all who participate. The Philadelphia Jovians have extended an invitation to all Jovians attending the New York convention to stop off in Philadelphia and join in this rejuvenation. Those intending to participate should notify Statesman J. C. Bartlett, 11 North Twenty-first Street, Philadelphia, Pa.

Sterilizing Water by Ultra-Violet Rays.

The proportion of ultra-violet radiation emitted by quartz lamps increases with the temperature, the limit of which is fixed by the point at which the quartz begins to soften which is 1200 degrees centigrade. The necessity of maintaining this high temperature makes it advisable to avoid undue cooling of the lamps by the water being sterilized. Before being subjected to the ultra-violet rays the water must be filtered clear, or the bacteria sheltered by the suspended particles will escape destruction. Efficient filtration for this purpose can be effected with sand filters. In order to ensure that no bacteria will escape, the water is passed close to the light several times in succession. In a plant fitted at Rouen, sterilization was effected at the rate of 100,000 gallons a day, the lamp used absorbing only 750 watts. Previous to the light treatment the water was passed through sand at the rate of 50 feet per day of 24 hours. Larger sterilizing units have since been constructed, one of which, operated with 12 lamps taking 1.5 kilowatts each, is sterilizing 1,700,000 gallons per day.

Jovians Unite with Electrical League.

At a recent luncheon of the Jovian Electrical League in Los Angeles, Cal., the 175 members present voted unanimously to consolidate with the Electrical League of Southern California, which move will make this the strongest electrical organization in Southern California. Max Loewenthal, who recently located in that city, spoke on the necessity and wisdom of co-operation in electrical merchandising. He denounced the folly of cutting prices and unfair dealing and gave instances to show the benefits of co-operation.

At another recent meeting this organization was addressed by B. F. Pearson, general superintendent of the Southern California Edison Company.

Philadelphia Section to Meet with Photographers.

The Philadelphia Section of the Illuminating Engineering Society will hold a joint meeting with the Photographic Society of Philadelphia on October 17 at 8 p. m., at the Engineers' Club.

There will be an address by the incoming chairman, George A. Hoadley; a report of the Pittsburgh convention by W. J. Serrill; and a paper entitled "A Simple Unit Method for Measuring the Intrinsic Actinicity of Flame Surfaces and for the Practice of Photography," by Mr. Steadman.

The meeting will be preceded by a dinner at the Club, 1317 Spruce Street.

Convention of Empire State Gas and Electric Association.

The ninth annual convention of the Empire State Gas & Electric Association was held in the United Engineering Societies Building, 29 West Thirty-ninth Street, New York, on Thursday, October 2. There were about 120 delegates present at the meeting.

At the morning session President C. G. M. Thomas reviewed the work of the Association during the past year and suggested a series of four mid-year meetings for the coming year. The report was well received by the members and the recommendations were referred to the incoming Executive Committee for further consideration. Following Mr. Thomas, the chairmen of the various committees submitted their reports. On behalf of the Electric Meter Committee, C. G. Durfee, chairman, reviewed the improvements that had been made in meters during the past year and called particular attention to a recent order of the Public Service Commission which practically prohibited the use of demand or ampere-hour meters. He called attention to the increase in favor with which ampere-hour meters were being viewed abroad and suggested that the Executive Committee should take up with the Commission the advisability of a modification of the order so that if satisfactory types of these meters were placed upon the market, they could be used by the companies.

J. T. Hutchings, chairman of the Committee on Electric Vehicles, urged the necessity for more charging stations throughout the state if touring in electric cars was to be made popular.

Arthur Williams, chairman of the Committee on Conservation, told of the work which had been done by his committee during the previous year.

A. D. Dudley and T. R. Elcock, Jr., outlined the proposed advertising campaign of the National Commercial Gas Association and J. M. Wakeman spoke of the plans of the Society for Electrical Development. The members voted their general approval of both of these plans and instructed the Executive Committee to give them further consideration.

Before adjournment was taken for luncheon cordial invitations were given to the members by the Consolidated Gas Company to visit the model apartment which had recently been opened and the New York Edison Company to visit the show rooms on West Forty-second Street.

Luncheon was served in the banquet rooms of the Engineers Club following which Chairman Decker and Commissioner Maltbie addressed the members informally.

Chairman Decker's subject was "Public Service by Private Corporations." He called attention to the potential competition under which the companies are operating which consisted largely of the possibilities of the use of substitutes for their service, and said that the Public Service Commissions were interested in the welfare of the companies furnishing the service as well as in the welfare of those who purchase it. He thought popularizing the service would be an aid in the solution of many of the problems which are confronting the companies.

Commissioner Maltbie had selected as his subject: "The Advantage of Public Utilities" and in a humorous vein referred to the advantages which gas and electric companies had over those selling other kinds of commodities. He also called attention to the responsibilities of the companies due to the fact that they were selling necessities. Mr. Maltbie told the delegates that a matter of primary importance was to gain the confidence of the public. He believed that the situation in this respect had been improved during the past seven years while the commissions had been in existence, but urged even greater publicity than had been common in the past. Following these addresses the members showed their appreciation of the presence of the Commissioners by a rising vote.

After luncheon the meeting reconvened and listened to an interesting talk, illustrated by numerous lantern slides, on "Accident Prevention," by James B. Douglas. In the discussion following this talk, Mr. Noonan, of Rochester, and Mr. Strickland, of Long Island City, showed a number of slides illustrating the work done by their respective companies.

Bruce E. Loomis then read a paper giving many valuable suggestions on the subject of "Fire Prevention." He also used the lantern to show tables of statistics referred to in his paper.

A paper was presented by C. H. B. Chapin on the subject of the "Future of Association Work," in which a plan was suggested for preventing duplication of effort on the part of associations and for accomplishing better results. Following this paper the Nominating Committee submitted its report and the following officers were elected:

President, J. T. Hutchings, Rochester.

First vice-president, J. C. DeLong, Syracuse.

Second vice-presidet, E. H. Palmer, Geneva.

Treasurer, Stuart Wilder, Mount Vernon.

Secretary, C. H. B. Chapin.

Members of the Executive Committee were elected as follows: C. G. M. Thomas, Long Island City; H. M. Beugler, Poughkeepsie; and C. A. Graves, Walton.

The meeting then adjourned.

The State of Washington now stands first in lumber production, with Louisiana second.

Monster Rejuvenation in St. Louis.

The rejuvenation of The Jovian Order held in St. Louis, Mo., at the Odeon Building, on October 1, was the largest yet held. Two records were broken on this occasion; the greatest number ever put through in one year by any one statesman, and the largest class, numbering 262. T. C. Bibber of New York, George C. Richards, statesman of Chicago, and National Mercury, Ell C. Bennett, assisted the local statesman, F. D. Beardslee, and Hercules H. Spoehrer in initiating the candidates.

Among those who joined were James E. Allison, formerly of the St. Louis Public Utility Commission; W. H. Whitton, secretary and treasurer of the Laclede Gas Light Company; F. C. Brooks, chief surgeon of the Union Electric Light and Power Company; E. R. Kinsey, president of the Board of Public Improvements; W. E. Rolfe, assistant to president of Board of Public Improvements; James Adkins, treasurer of the United Railways Company; Frank Adam, Frank Adam Electric Company; and C. L. Holman, president of the Laclede Gas Light Company.

Mayor Henry W. Kiel, who had signed an application, was unable to be present.

The Degree Team consisted of the following:

Jupiter, George Cullinan.
Hercules, H. Spoehrer.
Vulcan, John P. Casey.
Mercury, O. E. Hines.
Pluto, Burt Crouch.
Avrenim, A. C. Cornell.
Mars, Lee Rosebrough.
Neptune, P. B. Gilroy.
Apollo, T. T. Richards.

Over 500 Jovians and candidates assembled on the second floor of the Odeon Building at 6:30 p. m., where a buffet luncheon, with cigars and trimmings, was served. At seven o'clock the candidates were herded into one of the lodge rooms on the fifth floor, where Tom Bibber entertained them with recitations while preparations were being made in the large room to initiate them into the mysteries of Jovianism.

The rejuvenation of this large class will help the candidacy of W. N. Matthews, of St. Louis, as Reigning Jupiter, at the New York convention, October 14-16.

Another rejuvenation will be held prior to October 14, when the 20 or 30 left over from October 1 will be put through.

Copper Exports.

Exports of copper during September totaled 34,314 tons, against 25,572 tons for the month last year.

New Electrical and Mechanical Appliances

A Multiblade Fan.

The electric fan is by no means without interest, as the ingenuity of inventors has often been applied to the perfecting of details, rendering it possible to impel or propel the air with increased efficiency. The great strides made in aeronautics during the last few years have caused a very special degree of attention and interest to be directed to the problems attending air propulsion with beneficial results in departments other than these directly connected with aviation. A fan constructed by the firm of Pitters Patents, Limited, of London, England, is the result of careful investigations and tests carried out over a number of years, by which it has been shown that a greater volume of air can be moved with a smaller consumption of current by a multiblade fan than by single blades.

It is well known that with the ordinary types of fan, inefficiency results

Multiblade Ceiling Fan.

from eddy currents set up at different angles which prevent the free movement of the air. In the type of fan herewith illustrated a number of comparatively narrow blades are arranged one behind the other in position according to pitch and curving, the effect being that while the total air surface of each group is larger than that of the single blade of the ordinary type, the resistance is much less and no eddy currents are produced as the air moves freely through the channels formed by the blades. In this way all the particles of air are moving at a uniform velocity.

Some very interesting tests were made on a desk fan of the multiblade type having three blades mounted one behind the other and taking an average consumption of 25 watts when running at 1,400 revolutions per minute, each of the three blades being 12 inches in diameter. The tests were made in comparison with an ordinary single-blade fan. At four feet away, the velocity of air was 21 per cent greater with the multiblade fan as compared with the single-blade fan. At eight feet the velocity was 30 per cent greater and at 13 feet it was 37 per cent greater. In addition to this the current consumed was smaller than with the ordinary type of fan. Owing to the greater velocity of air the disturbance can be felt at a greater distance and over a larger area.

A ceiling fan of the type shown in the illustration was tested against the ordinary type of ceiling fan working under the same conditions and with the same current consumption gave the following results. At four feet away the velocity of the air was 20 per cent greater with the multiblade fan as compared with the single-blade fan; at five feet away the velocity was 39 per cent greater and at six feet away the velocity was 52 per cent greater. Hence the ceiling fan can be placed at a greater height to give the same air disturbance as an ordinary fan, while the hot air which naturally accumulates at the top of the room is freely circulated.

In exhaust-fan work it is claimed that the amount of air moved is 35 to 40 per cent greater than that moved by a box-blade fan of the same diameter running at the same speed while the current consumption is lower. A fan with blades 12 inches in diameter running at 900 to 1,200 revolutions per minute gives, with open inlet and outlet, approximately 850 to 1,200 cubic feet per minute, while a 60-inch fan running at 190 to 250 revolutions per minute will give approximately 25,200 to 46,200 cubic feet of air per minute with open inlet and outlet. The multiblade fan, therefore, is worth careful attention.

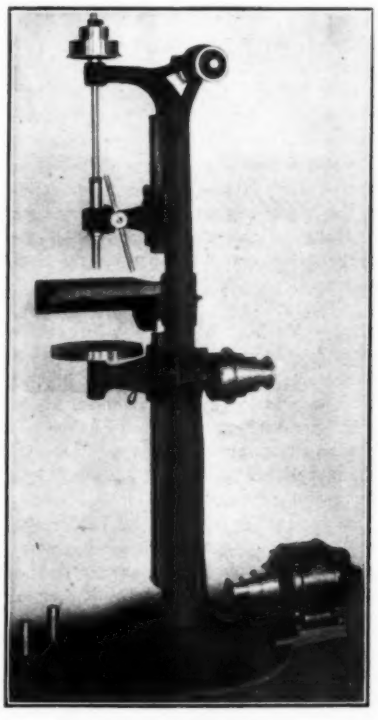
British Patent for Renewable Metal-Filament Lamp.

The specifications of a patent designated as No. 24,571 of 1912 were published by the British Patent Office on August 28, 1913. The patent is issued to F. Harrison and F. L. Harrison and covers a renewable metal-filament lamp. We are indebted to *Electrical Engineering*, of London, for the following description:

The leading-in wires are continued through the whole length of the stem. The spider has hooked arms at the cap end and specially designed spring gripping arms, at the pip end. If hair-pin filaments are used, a broken section can be replaced by opening up the pip end of the lamp bulb and inserting a new filament section.

Motor-Driven Drill.

The drill shown in the illustration herewith is one of several modernized designs of machines that have been on the market for many years. Motor drive is one of their conspicuous features. The addition of the motor



Motor-Driven Drill.

makes the drill an independent unit which can be installed wherever desired without reference to lineshafts. The motor is stopped and started by a switch arranged conveniently for the operator.

Each drill has six speeds obtained through cone pulleys, giving a range of from 600 to 2,400 revolutions per minute. The spindle has a ball thrust bearing. The drills are made by the Francis Reed Company, Worcester, Mass., and are driven by Westinghouse motors.

Electric Prism Action Sign.

The electric prism action sign is one of the latest novelties in the advertising signboard line. It is this electrically operated action feature, combined with elaborate electric effects, that make this sign so unique. In operation this sign is extremely simple. The intention is that after one advertising surface has been on exhibition for a given length of time, the surface is changed, it disappears and in its place comes another surface of advertising matter, and so on. This changing effect is secured by the use of a series of prisms, these generally being four-sided. Each of these prisms has four longitudinal faces and carries four leaves. During the changing process these leaves lie flat against the prism, but when the changing period is nearly over the leaves that are fastened to the front sides of the prism, fall forward in such a manner that they completely fill the spaces between the prisms and thereby form an apparently unbroken advertising surface, which is really a surface composed of alternate leaves and prisms. One or more advertisements may be placed upon this painted surface.

A feature of this sign is that by its use it is possible to secure four times the advertising surface as is possible with the ordinary wooden signboard of the same dimensions. For instance, on a 20 by 20-foot wooden board there are 400 square feet of painted surface, while with this new sign, 1,600 square feet are available. This additional surface is secured by the fact that all four sides of the prisms are painted, and as each side carries a corresponding leaf, there are four complete advertising surfaces.

The electrical display is one of the principal features of this sign. This may be made as elaborate as is desired by the owner. During the periods of changing from one advertising surface to another there are various colored flash effects, there being a different colored effect for each period of changing. The instant that the changing process is completed the colored lights disappear and in their place comes a blaze of white light shining directly upon the sign and illuminating it brilliantly. The colored-light effect is secured by means of a series of lenses imbedded around the edges of the sign, in addition to electric lamps placed upon the sign's edge and also upon the ornaments at the top and sides.

In the entire sign the journals run on roller bearings and by these friction is minimized. So easy running is the entire affair that everything, including the prisms and the flash effects, is operated by a remarkably small electric motor. The prisms and leaves are made detachable and interchangeable. The advertisements are painted upon the prisms and leaves while they are in the workshop and it takes but a few minutes to detach the old set and hang the new set of prisms and leaves.

On this sign any number of prisms may be used and these may be as large in diameter and length as is desired. They may also contain as many faces as the advertiser desires. The completed signs may be of any size, from the small show-window sign to the large open-field affair. The signs are made entirely of iron and steel. This electric prism action sign was invented by J. H. La Pearl and is manufactured by the Day & Night System, of Los Angeles, Cal.

Electric Prism Sign.

Prisms in Act of Changing.

In 1912 Arkansas mined 2,100,819 tons of coal, valued at $3,582,789.

New Faries Desk and Piano Lamps.

A new line of ornamental but moderate-priced portable lamps for roll-top or flat-top desks, large tables or pianos has been placed on the market by the Faries Manufacturing Company, Decatur, Ill. Each of these lamps includes a heavily weighted cast-iron base to prevent overturning of the lamp and to give it a rigid foundation. On the bottom of the base is a thick pad of felt to prevent scratching; thus the lamp can be used on the most highly polished surfaces without damage to the same. Each lamp is equipped with one or two handsome glass shades, green on the outside and with a white opal reflecting surface on the inside. The ribs on the glass shade serve both to enhance its appearance and to break up any streaky filament reflections.

Fig. 1.—Faries Duplex Desk or Table Lamp.

A simple lamp for a roll-top desk or piano is among those made. The base is six inches square. The arm is both horizontally and vertically adjustable and extends 11 inches from the center of the base to the shade. The angle of the latter is adjustable; the spread of the shade is 8.5 inches. A 25-watt or 40-watt lamp is best adapted for this unit. The finish of the metal is brush brass or statuary bronze.

Fig. 1 shows a duplex lamp for a flat-top desk, library table or similar large surface where two persons may use opposite sides of the desk. The height of this unit is 16.5 inches to the center of the shade. The latter is 4.25 inches from the center of the column. Simple and graceful lines characterize the design of the column. The standard finishes are brush brass

with black relief or statuary bronze.

A similar but somewhat more elaborate design is shown in Fig. 2. In this case the base is 8 by 8 inches and with the column is very artistically designed. The outfit is beautifully finished in either old ivory or statuary bronze with green relief or brush brass with black relief.

The designs shown are only typical of the great variety included in the new line. In each case nine feet of reinforced silk cord and a good attachment plug is provided with the lamp.

Wireless Train Control.

F. W. Prentiss recently conducted a very successful demonstration of the Prentiss system of automatic "wireless" train control, of which he is the inventor, at the Hampton Court Station of the London and South Western Railway. In this system the track is divided into a number of insulated sections, in each of which a low-voltage track circuit is arranged, with, in addition, a high-tension wave wire running between the rails. At the end of each section is a box containing the high-frequency plant for the supply of current at 20,000 volts to the wave wire. This plant is controlled by a relay in connection with the track circuit of the section ahead, with the result that if that track circuit be short-circuited the controlling relay is de-energized, and the supply of high-tension current to the wave wire ceases. The locomotive is fitted underneath with an arrangement of wires equivalent to the antennae of the ordinary wireless apparatus. These receive the energy transmitted from the wave wire, and by means of a system of coherers and relays in the cab a green "line-clear" signal is provided for the driver if the section ahead is unoccupied. If, however, the section ahead be short-circuited, the wave discharge ceases, and a red light is shown and a buzzer simultaneously sounded, while the brake is at the same time applied, these operations being effected by power obtained from a battery in the cab. Provision is made to enable the driver to release his brake, but the red light and the buzzer continue until the section ahead is cleared, when the high-frequency supply is re-established and normal working is resumed. The system, therefore, provides for a continuous danger signal on the locomotive so long as the line is not clear, the automatic application of the brake and a prompt intimation of the restoration of line-clear conditions. In the event of failure of the high-tension or the track circuit, danger indications would be given. The operation of the cab apparatus naturally depends on uninterrupted battery supply. The demonstration was quite successful, the train being brought up on every trial by the automatically applied brake, although the regulator was untouched. The system requires electrical supply to all the section-boxes, and transformers in each section-box, in addition to the boxed-in high-tension wire between the rails and the apparatus on the engine. The expense question is therefore one which will have to be seriously considered before the system is likely to be largely adopted. In addition to initial cost the working cost must also be taken into account, the power taken by a half-mile section being about one horsepower.

Fig. 2.—Ornamental Lamp for Flat-Top Desk or Table.

Electric Boudoir Set.

A three-piece electric outfit of great utility in the boudoir or hair-dressing parlor has been placed on the market by the William E. Slaughter Company, Incorporated, 1712 Michigan Boulevard, Chicago. The devices are shown in the accompanying illustration; they are the invention of Mr. Schwartz, who has been engaged in the development of electric heating devices for many years. In this particular set it was found best to have individual devices for the curling iron, electric comb and the electric waver rod. Each of these contains an individual heating element and is a complete unit. A silk cord with swiveled attachment plugs at each end fits all of the appliances. That plug which fits into each of the devices is of ingenious construction, arranged so as to prevent breaking of the cord at the place where frequent bending has been found to cause trouble.

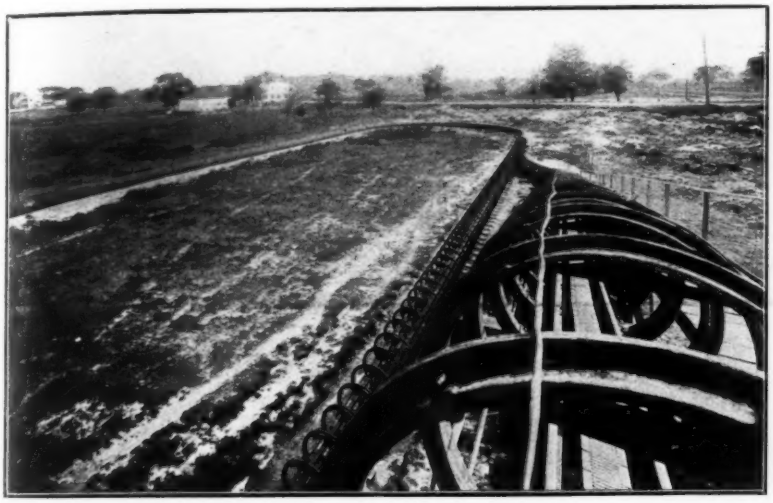
The heating element in the comb takes 66 watts; the elements in the curling iron and the waver each consume only 22 watts, thus making the entire outfit extremely economical. By this arrangement the comb is supplied with more current and operates more satisfactorily than in cases where the comb is combined with the curling iron. Each of the devices is made entirely of aluminum and this metal has been found to be excellently adapted to the purposes because it does not stick to the hair when heated. The heating element in each of the devices is so arranged that it does not become so hot as to injure the hair. These devices have been tried out and have been highly recommended by all users. The electric comb is very effective in drying the hair after shampooing; it can also be used as an ordinary comb. The curling iron and the waver are light in weight and like the comb, are ready for service in one minute.

Schwartz Electric Waver, Comb and Curling Iron.

The American Electrical Supply Company, Chicago, Ill., held a very satisfactory meeting of its sales force on September 26 and 27.

Electric Carrier System for Mail, Merchandise, Etc.

As the result of several years of experimentation and development there has been perfected an ingenious electric system for the rapid transport of all kinds of mail, express matter, parcels, merchandise, etc. A demonstration of the system was recently made on a large-size model of the system installed at Paterson, N. J.



View of Demonstration Trackway, Looking from Top of 20-per-cent Incline.

This was attended by the representatives of many technical journals and of various interests that could make use of the system to advantage.

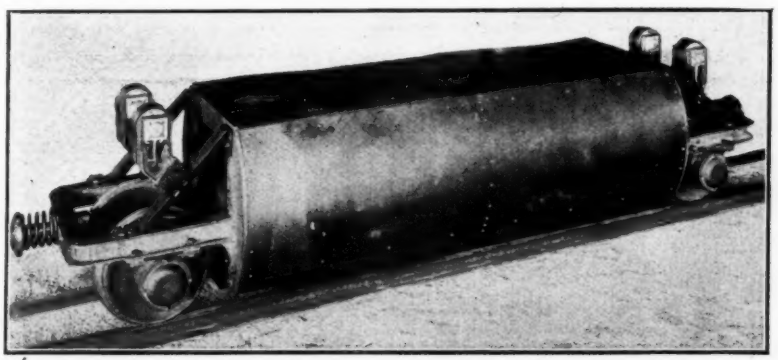
This system, known as the "electric carrier system," at first glance resembles a pneumatic-tube system, but differs from the latter radically in its motive-power equipment and therefore in the construction of the cars and tubes or trackway. It also does not have the inefficiency, lack of capacity and other shortcomings of the pneumatic system.

The electric carrier system comprises a source of alternating current supplied through two feeder rails above the cars to collectors on the cars, the running rails on which the cars operate constituting the third conductor for a three-phase system. The two feeder rails and the two running rails referred to are mounted within an inclosing structure built of steel, cast iron or concrete, usually in circular form, but which may be made in any form and arranged for installation underground, elevated or on the surface. The system is naturally best adapted for operation as an underground system.

The principle of operation is that of a squirrel-cage induction motor, in which the primary and secondary elements are interchanged from their usual relation and the secondary element is longitudinally spread out. Thus the primary, corresponding to the ordinary induction-motor stator, consists of a flat laminated-iron member attached to the bottom of the car; the slots in this member contain windings connected to the power supply. Between the two running rails is laid a laminated-iron longitudinal member, the slots of which contain short-circuited windings corresponding to the rotor windings of a squirrel-cage motor. The car contains no rotary motor, but is operated directly by the magnetic pull and push exerted between the two laminated-iron members referred to; in other words the car is swept along by the longitudinally moving magnetic field produced between these two members. The inventors of the system claim that this equipment is so simple in construction and maintenance and is so efficient in operation as to possess decided advantages over any similar car with rotary motor, gearing, etc.

The trackway used in the demonstration plant at Paterson is shown in the accompanying illustration. In this case the outside diameter of the tube is 36 inches. In order to make the operation of the cars more clear the inclosing tubing was left off a considerable portion of this installation, the cast-iron ribs being clearly shown in the illustration. In the demonstration plant the main trackway consists of an eliptical loop about 1,000 feet in circumference. At one end of this is a terminal station connected through two switching loops with the main trackway. Along one side of the trackway is a trestle about 220 feet in length on which the grade is about 20 per cent. The shortest curves have a radius of 40 feet. Through this installation there were operated at the recent demonstration several cars of the type shown. These cars weigh 1,250 pounds empty and were operated with various loads ranging up to 1,000 pounds of sand. The cars operated over the tangents, the curves, and the trestle, and took all of the various switches without difficulty at a speed of about 30 miles an hour. The cars were also operated with trailers.

When descending a grade power is regenerated back to the line, this action serving as a brake in keeping the cars



Typical Car With Temporary Top.

The cars are controlled from a central control station. They can be started, accelerated, retarded, stopped or reversed by pressing buttons which control the supply of current to the sections of the two feeder rails. This control is instantaneous and so smooth as to eliminate all shock to the cars, their contents, or the trackway. The cars may be switched automatically from the main line to any predetermined branch, or from any branch to the main line, without interfering with the movement of other cars running before or behind the switching cars. By means of a patented signal system the location of the cars in transit is indicated at the control station; the signals are inductively transmitted by the cars, without physical contacts, through pilot coils imbedded in the track and connected to the control station through a cable.

close to synchronous speed. Since the cars run at all times close to this speed, the danger of collision is practically eliminated, but even if one car should be slightly retarded the car following will gradually approach it and the two operate as a double unit.

The system described is controlled by the Electric Carrier Company, 220 Broadway, New York City.

Unique Indirect Lighting of Banks.

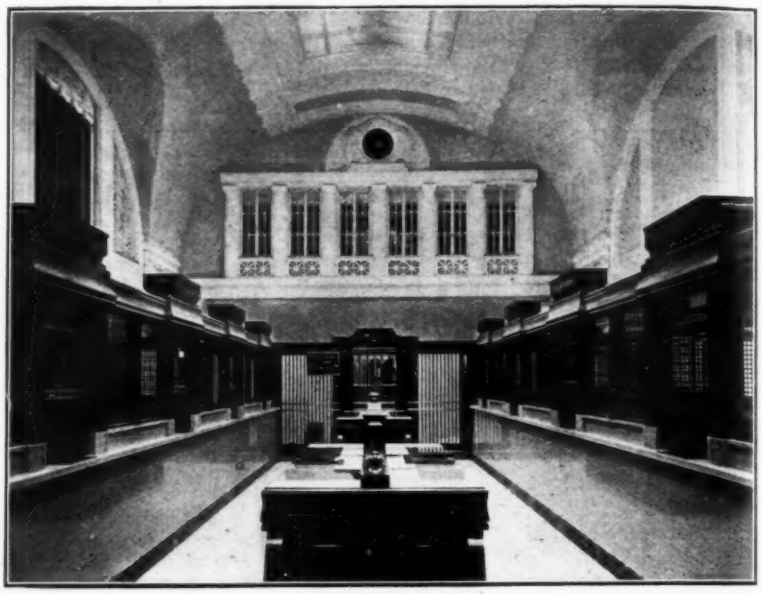
In the construction of modern banking institutions great attention is given to the general architectural design, both of the exterior and interior of the bank. As a rule the architect aims to produce a structure combining in a pleasing and yet dignified manner the ideas of solidity and conservatism, so as to imspire the confidence and good will of the public. The main banking room usually is, or should be, a large, lofty and highly ornamental room. It should be well lighted and the lighting equipment should be inconspicuous or at least so designed as not to mar the beauty of any part of the room.

One can quickly appreciate that the entire absence of pendent fixtures preserves prospective in a remarkable manner, and that a beautiful indirectly illuminated ceiling, from which the room is actually lighted, gives the interior a high, spacious and dignified appearance. It is impossible to secure the same effect by suspending visible light sources from the ceiling, for the eye finds it difficult to see past a bright light, and the ceiling is visually lowered besides being unevenly lighted.

The foreging ideas have been well carried out in a number of recent installations incorporating unique features. An interesting installation of this type of lighting is the Swedish-American Bank, at Balmoral and North Clark Streets, Chicago, of which two night views are reproduced herewith. It will be seen by the movement of the hands of the clock dial in the interior view that the photographic plate was exposed for about five minutes, which is an unusually short time for the making of a photograph where no flash-light or other artificial aid is used, and illustrates very graphically the excellent lighting effect produced. It is interesting to note that this installation is kept burning evenings solely for the attention it attracts and the advertising value it possesses, as is evident from the exterior view.

Outside of Swedish-American Bank, Showing Brightly Illuminated Interior.

The main banking room of the Swedish-American Bank is 50 feet long, 32 feet wide and 26 feet high. The illumination is accomplished by two type E-100 X-Ray reflectors, using 60-watt tungsten lamps, contained in each of the eight boxes or troughs along the bank rail over the tellers' wickets, etc. These are nine feet above the floor. Besides this equipment there are four type E-255 reflectors, using 150-watt lamps, over the vestibule entrance, which, being at the opposite end of the bank, are not shown in the illustration. There are two skylights in the ceiling for day-lighting purposes, and these are also utilized for artificial lighting after dark by placing eight style-765 reflectors, using 100-watt lamps, above them. The average illumination is about four foot-candles on the working plane. The illumination is exceptionally uniform; every part of the room is full of light—a valuable feature in a bank.

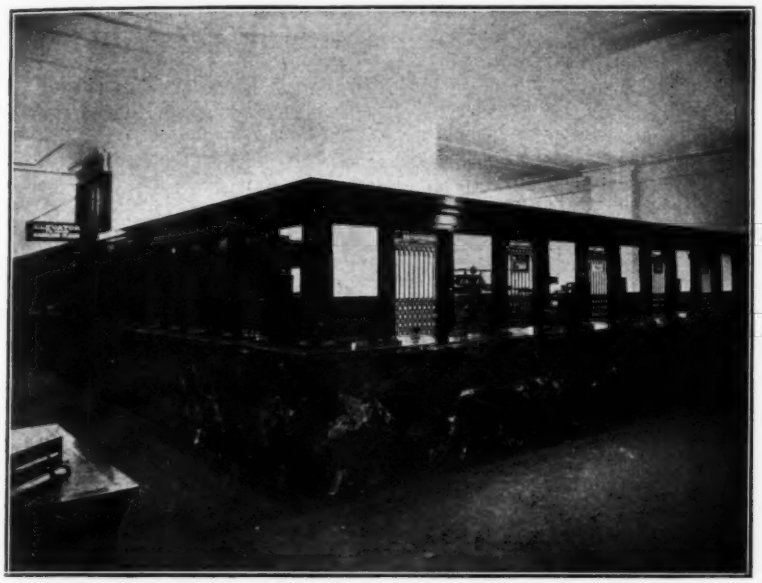


Main Banking Room Illuminated from Invisible Light Sources.

The directors' room and bookkeeping section are illuminated from four style E-981 luminous-bowl indirect fixtures using 100-watt lamps. The directors' room is 18 feet long, 16 feet wide, and 10 feet high, and the luminous-bowl fixtures are suspended 24 inches from the ceiling to the top of the reflector contained within the glass bowls.

This lighting installation was made by the Pierce Electric Company, of Chicago, which is specializing in auditorium illumination. The architects for the Swedish-American Bank were Ottenheimer, Stern & Reichert, also of Chicago.

The Union Trust Company, of which but a portion of the savings department is shown in the third illustration, is another Chicago bank using this type of lighting. Here again it shows to advantage as the comparatively low ceiling in the room would make it difficult to use pendent fixtures, and by lighting from the bank-railing top the utmost spaciousness is gained. The savings department banking room is 38 feet wide, 74 feet long and 12 feet high. There are 180 small type E-40 reflectors concealed in the trough surrounding the tel-



Indirect Illumination of Savings Department, Union Trust Company.

ers' cages, bookkeeping rooms, etc. The distance from the top of the reflectors to the ceiling is 4 feet 6 inches, and one 25-watt lamp is used in each reflector, giving a wattage consumption of 1.6 watts per square foot, and an average foot-candle intensity of 4.0 on the working plane.

A similar equipment to that in the Swedish-American Bank is at present being installed by the City National Bank of Evansville, Ind. The banking room in this case is larger, being 92 feet long and 40 feet wide with a 29-foot ceiling. Eighteen type E-500 reflectors, using 500-watt lamps, are concealed along the top of the bank rail, and here again the reflectors are 9 feet above the floor.

The reflectors for the lighting equipment in each of these installations were furnished by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago.

Night View of Entrance Lanterns Lighted by Quartz-Tube Mercury-Vapor Lamps.

Quartz-Tube Lamps for Entrance Lanterns.

An interesting installation of Cooper Hewitt quartz-tube lamps has recently been made in Chicago, at the Continental and Commercial National Bank Building. The lamps, six in number, are placed in ornamental lanterns hung from the side of the building, about 15 feet above the level of the sidewalk. Four lamps are located on the Adams Street side and two on the Clark Street side and the illumination resulting therefrom is decidedly brilliant, but not to the point where it becomes objectional. No light source is visible and it seems that the familiar greenish color effect produced by Cooper Hewitt lamps has been almost entirely eliminated in the new lamp.

The accompanying illustrations show the night and day appearance of this installation. From the night view some idea of the intensity of the illumination can be gained by noticing the effect of the light on the surroundings.

The lamps are rated at 3.3 amperes at

Day View of Entrance Lanterns, Continental and Commercial National Bank Building.

220 volts. They were installed under the direction of G. C. Keech of the Cooper Hewitt Electric Company for the Commonwealth Edison Company, which will shortly occupy this building.

Westinghouse Synchronous Frequency-Changer Sets.

Many operating conditions require the conversion of electrical energy from one frequency to another. An economical and efficient means of accomplishing this is by means of frequency changers, of which the type manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., will be described in this article.

Some of the special features of these Westinghouse sets are that their design embodies space economy; they are self-

starting; the stators of both motor and generator are mounted on a common bedplate and as close together as mechanical clearance and ventilation requirements will permit. The rotating parts of both machines are mounted on a common shaft and where practical only two bearings are supplied. A pedestal bearing is ordinarily mounted on a "bridge," as illustrated in Fig. 1. In case of repairs, this bridge can be quickly removed and the stator easily slid to one side along the bedplate, to allow ready access to either stator or rotor.

If conditions require two or more synchronous sets to operate in parallel, the rotors of all generators must bear the same phase relationship on their respective shafts. It is not practical to set these rotors with sufficient accuracy during the process of manufacture. One stator is, therefore, set in a "cradle" which permits of sufficient rotation to obtain a proper alignment, as shown at the right in Fig. 1. This adjustment has to be made only

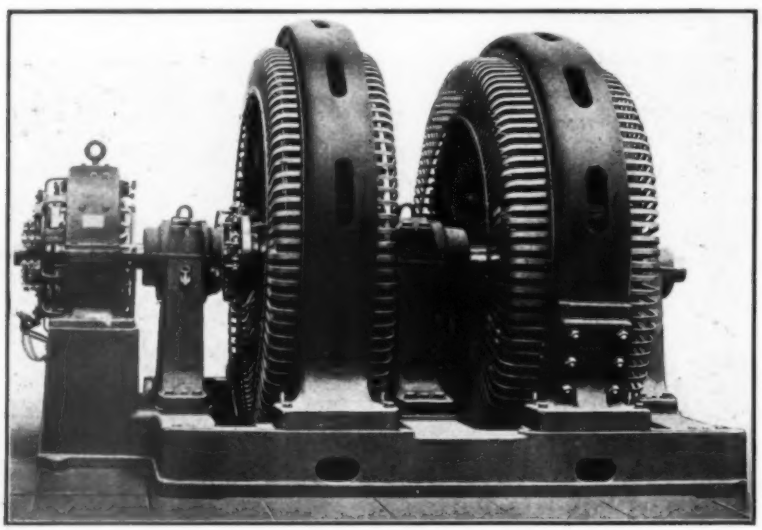


Fig. 1.—Westinghouse Frequency-Changer Set With Exciter.

when starting up the sets for the first time, and thereafter their relative locations do not change.

The stationary frames (Fig. 2) are made of strong, rigid iron castings into which soft-steel laminations are dovetailed and securely fastened. Ventilating ducts are spaced at frequent intervals across the face of the armature punchings. The armature coils are vacuum-dried and impregnated before there is applied the outside insulation, consisting of wrappings of mica and paper on the straight portions of the coils which lie in the slots and servings of treated cloth over the V-shaped coil ends.

A rugged spider is used, to which the field poles, built of thin steel laminations riveted together, are either bolted or dovetailed as required by the speed of the set. These poles have overhung tips provided to support the field coils which are built up of heavy copper strap wound on edge, and insulated in such a manner that the individual turns are each exposed to the air for ventilation. The heavy copper bars of the damping outfit are imbedded in the poles as shown in Fig. 3.

The bearings of these standard frequency changers are self-oiling and built of cast-iron shells of ample size, split horizontally to allow ready removal, and lined with grooved babbitt metal. They are fitted with oil rings which carry the oil from a well in the bottom of the shell to the shaft. The shaft is provided with oil-throwers and catchers. Covered openings in the upper shell facilitate inspection of the oil rings.

The selection of a set to be used for each installation is worthy of careful consideration. A high-speed set is generally somewhat cheaper than a low-speed one, but may not give the exact frequency ratio required. The synchronous type has certain advantages which render it the almost invariable choice, but there may be cases where an induction set would be preferable.

The synchronous set is slightly more efficient. It permits of operation of the motor at unity power-factor, its point of highest efficiency, or by slightly increasing the capacity, at a leading power-factor and thus obtaining a corrective effect which is very often desirable. The synchronous set can at slightly increased expense be made reversible.

The synchronous set is at a disadvantage when of relatively small capacity and required to tie two much larger generating systems together. In this case the speed of one system must always have the same relation to the speed of the other system and any change on one must be transmitted through the set and the frequency changer supply the power necessary to bring the speed of the other system to its corresponding value, thus frequently throwing heavy overloads on the set. Here the induction outfit, with some variation in slip possible, may be the proper machine.

A direct-connected exciter can be supplied mounted on either motor or gener-

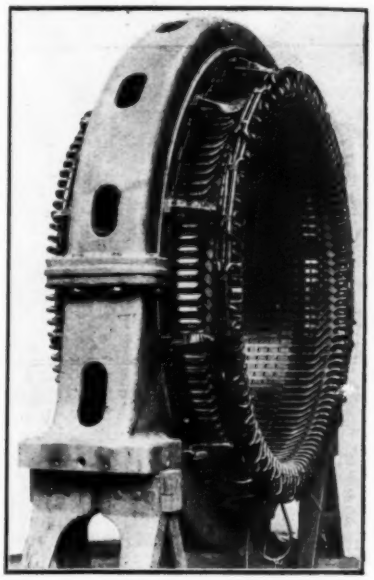


Fig. 2.—Stator of a Frequency Changer, Showing Armature Windings.

ator end of the set, and of capacity to furnish either motor or generator, or both, with the necessary excitation. When variable loads are likely to be encountered, and an automatic regulator is used, separate exciters for motor and generator are usually preferable, inasmuch as a common exciter would necessitate constant attention in order to control the power-factor of the motor.

All sets are carefully inspected during each step in the process of manufacture

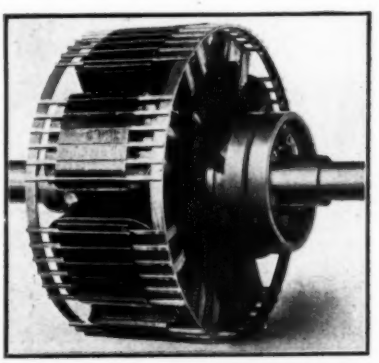


Fig. 3.—Revolving Field for Frequency Changer, Showing Field-Pole Construction and Copper Damping Outfit.

and before each succeeding operation is started. When completed they are tested under conditions as nearly identical as those to which it will be subjected.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

BAGLEY, IOWA. — Bagley has voted in favor of a municipal electric light plant.

ROLLA, N. D.—A franchise has been granted to John Munro for electric lighting here. C.

GYPSUM, KANS.—The Council is planning to improve the city lighting. Address the city clerk.

FERGUS FALLS, MINN. — The council has voted to install a "White Way" at a cost of $4,500. C.

RADNOR, PA.—Better street lighting will be established here. Address the city clerk in regard thereto.

GROVEVILLE, N. J.—The Public Service Electric Company will install an electric lighting system here. A.

RACINE, WIS.—John C. Slater is back of a movement for decorative lighting in the business district. C.

SWANVILLE, MINN. — Albert Mielke will build a power plant and it is stated, will furnish the city with electric lights. C.

LADYSMITH, WIS.—The Ladysmith Lighting Company will install a new dynamo and make other improvements. C.

FOREST CITY, IOWA.—The Electric Light Company plans the erection of a new electric light power house this fall.

MUSCATINE, IOWA. — Alderman F. Sullivan is back of a movement to establish and erect a municipal lighting plant here. C.

PLANKINTON, S. D.—J. B. Hones, Fresno, S. D., has bought the local electric light plant and will make extensive improvements. C.

BENWOOD, W. VA.—The Brooke Electric Light Company has secured a franchise to supply the city with electricity for 30 years.

LOS ANGELES, CAL.—The Board of Public Works is advertising for bids for supplying and lighting 550 arc lights for two years.

SANDERSVILLE, GA.—A "White Way" will be established in the business part of the city. Address the city clerk for particulars.

PEORIA, ILL.—The Council will improve the street lighting on several streets. Address City Engineer Jeffries for information.

BLAIR, NEB.—Len Phillips is circulating a petition for a special election to vote bonds for the erection of an electric light plant. C.

EASTON, PA.—The Eastern Pennsylvania Power Company is preparing plans for alterations and additions to several large power plants.

UNION, TENN.—The Union Light Company has been incorporated with a capitalization of $10,000 by J. M. Cole, P. L. Ratcliff and others.

BAKER, MONT.—R. R. Pearce has decided to establish an electric lighting plant here provided the Council will grant him a satisfactory franchise. C.

ROSSER, MAN. — The Winnipeg Electric Company has secured a 30-year franchise here for light and power. Reeve Haddow, Rosser, is interested. C.

BRUNSWICK, GA.—The Brunswick White Way Association has been incorporated with a capital stock of $2,000 by E. C. Bruce, E. L. Stephens and others.

WHITING, KANS.—This place has voted $8,000 in bonds for electric lighting and plans are being made to bring power from Horton instead of building a plant here.

PACIFIC JUNTION, IOWA.—A franchise has been given to the Red Oak Electric Company, Red Oak, and a line will be built from that city for light and power. C.

LEXINGTON, MASS.—The Edison Electric Illuminating Company, of Boston, will place its wires, from the new transformer station to Elm Avenue, in underground conduits.

STEWARTSTOWN, PA. — The works of the Deer Creek Water & Power Company will be greatly enlarged and improved, the details of which have not yet been decided upon.

PUYALLUP, WASH.—A. L. Thorn, commercial agent of the city of Tacoma Light Department, wants to sell light to this city. A power line would be built, in this event, at an estimated cost of $15,000. C.

MALDEN, MASS.—Plans are under way among Malden merchants to establish a new street lighting system along the business center containing 85 arc lights in addition to the present lights.

POYNETTE, WIS.—Plans and specifications for the proposed electric light and power dam are ready and bids will soon be let for the construction work. Write the village recorder for information. C.

DRAKE, N. D.—With the establishment of an electric light plant here at an early date it is probable that both Balfour and Anamosa will be lighted from here. Address Jacobsen & Son, for desired information.

TOPEKA, KANS.—The installation of better fire protection at the city pumping station and also the installation of an electric light plant to light the station was authorized at the meeting of the City Commission.

MARINE, ILL.—Plans are being made for the construction of a plant for the Marine Electric Light & Power Company, which will furnish light for the city. The plant will be controlled by former Mayor Fred Scheurer, according to present reports.

WHITESBURG, KY.—Ira Fields, Jr., of Harlan, Ky., is negotiating for the establishment of an electric light plant in Whitesburg. The plant is assured as soon as the necessary machinery can be purchased and installed.

PORTLAND, ORE. — The City Council has decided to employ a hydro-electric engineer to make an investigation of sites and other matters pertaining to the installation of a municipal electric lighting and power plant.

ISMAY, MONT.—J. E. Pringle and George W. Burt, who are back of the movement to build an electric line between here and Baker, Mont., have secured sufficient funds and engineers will soon be engaged to prepare estimates. C.

CHEHALIS, WASH.—L. H. Webb and S. Norton Bobb, representing the Central Light & Power Company of Pe Ell, have applied for a franchise from the County Commissioners for a transmission line to Francis and Lebam.

SULPHUR SPRINGS, TEX.—B. F. Ashcroft & Sons, owners of the electric light plant here, will spent $25,000 in building a practically new plant. New machinery of the latest type will be installed capable of furnishing power for 10,000 lights.

TORONTO, ONT. — Improvements costing several million dollars probably will be made by the Toronto Electric Light Company in the event of the purchase of the assets of the company by the city failing of consummation.

SUSANVILLE, CAL.—The Board of Supervisors of Lassen County, Cal., will, on November 10, receive bids for the sale of an electric-transmission franchise along the public highways of the county, as applied for by the Pitt River Power Company.

BELLEFONTE, PA.—A plant for the electrocution of prisoners is to be installed in the new prison now being erected here. Bids for this construction will be received by Superintendent John Francies, of the Western Penitentiary, Pittsburgh, Pa.

BOISE, IDAHO.—Permission to transfer its Boise franchise to the newly organized Idaho Power & Light Company was granted the Beaver River Power Company by the City Council recently. It is understood the new owners are planning to make extensive improvements. O.

SAWTELLE, CAL.—Sawtelle has started an ornamental lighting project for Oregon Avenue and proposes, with the cooperation of the Santa Monica people, the County Supervisors, and the property owners through Beverly and Sherman, to make it a

through-lighted boulevard to Los Angeles. T.

ST. MARYS, O.—L. G. Neeley, of St. Marys, one of the owners of the Mansfield Gas Light Company, has announced that the company will start soon on the construction and equipment of a modern electric plant to supply current for commercial purposes.

SAN FRANCISCO, CAL.—The Sonoma Valley Water, Light & Power Company of El Verano, Cal., has applied to the California State Railroad Commission for authority to issue $30,000 in bonds, the proceeds to be used to pay for existing indebtedness and to make extensions to the system.

MOUNTAIN LAKE, MINN.—The Village Council has granted a 15-year franchise to the local milling company to build electric lines and to put up poles for the purpose in the streets and alleys. A 10-year contract has been made with the milling company to illuminate the streets at $75 per month.

FALL RIVER, MASS.—The Massachusetts Gas & Electric Light Commission has authorized the Fall River Electric Light Company to issue 2,000 additional shares of stock at $150 per share. The proceeds are to be used for paying the floating debt already incurred and making improvements and extensions to its plant.

DUBLIN, TEX.—The Dublin Gas & Electric Company will construct an electric power transmission line from Dublin to Hamilton. The company is also constructing a power transmission line from Dublin to Hicol, a distance of 22 miles. In addition, it will erect a new central power station for providing additional power for other lines being contemplated.

BEAUMONT, CAL.—The announcement has been made that the Southern Pacific Railway company will in the near future install an electric lighting plant here for the purpose of furnishing electricity to illuminate its passenger and freight depots and surrounding property. The yards and roundhouses of the company will also be lighted by electricity. T.

EASTON, PA.—Articles of incorporation have been filed by the Edison Illuminating Company, of Easton, capitalized at $250,000. The incorporators are H. R. Fehr, H. J. Steel, S. H. Hackett, of Easton; W. H. Walters, Phillipsburg, N. J.; J. C. Dawson, Thomas Newhall, W. A. Stern and A. L. Smith, of Philadelphia; and R. P. Stevens, of Allentown.

BANNING, CAL.—The Consolidated Power Company, which has finished a six-mile conduit for the diverting of Whitewater River from its sink in the desert primarily for irrigation purposes, announces that two and possibly three hydroelectric power houses will be built next spring a few miles north of Banning, the diverted water being used for developing the power.

PORTLAND, ORE.—The City Council will employ a hydroelectric engineer for the purpose of investigating various municipal lighting and power plant projects, which Commissioner Daly of the Department of Public Utilities, has under consideration. When a site for the proposed municipal plant has been decided upon, The proposition will be voted upon.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

SHEBOYGAN, WIS.—The Citizens Telephone Exchange will reconstruct its local system at a cost of $30,000. C.

PLAZA, N. D.—The North Dakota Telephone Company is planning to run a telephone line from Plaza to Parshall.

JOHNSONVILLE, S. C.—The Johnsonville Telephone Company has been incorporated with a capital stock of $1,500 by K. McCutcheon, S. B. Boston and others.

MORRISVILLE, PA.—The Pennsylvania Railroad Company will improve and extend its telephone system at its West Morrisville Yards, and in the Trenton district. A.

FRANKFORT, KY.—Josephine Telephone Company has been incorporated with a capital stock of $1,200 by Elmer Southworth, C. T. Lancaster, J. Lancaster and others.

LEONARD, TEX.—Leonard Telephone Exchange has been incorporated with a capitalization of $10,000 by J. A. Mitchell, J. A. Craft, and O. S. Ferguson, all of this place.

RAY, N. D.—Williams Mutual Telephone Company is calling for bids for material and supplies needed for the completion of its line here and the installation of the local service station. C.

GRAFTON, N. D.—Northwestern Telephone Company will make extensive improvements in the local plant. Heavy cables will be used to replace the large amount of wire being carried. C.

MONMOUTH, ILL.—The Warren County Telephone Company is being formed by residents of Warren County. It will have a capital stock of $40,000 and will build and operate its own lines. Z.

PITTSBURGH, PA.—The Central Telephone Company will erect a large office building and expend a large sum for improvements and extensions. Address the secretary for information desired.

NEENAH, WIS.—Wisconsin Telephone Company will build two rural lines, one along the Appleton road out of Menasha with three services and the other in West Menasha with eight services. C.

GREEN BAY, WIS.—Wisconsin Telephone Company will reconstruct the entire exchange. Additional aerial, underground and submarine cable will be constructed, at an estimated cost of $61,000. C.

NASHVILLE, TENN.—Fox Springs Home Telephone Company has been incorporated with a capital stock of $1,000 by J. E. Sidwell, J. D. Hunter, R. R. Riley, L. B. Brown, J. T. Chilton, A. P. Chilton, J. L. Smith and B. W. Goodpasture.

BONNER'S FERRY, IDAHO.—M. F. McAnnelly, of Copeland, contemplates organizing a stock company to build a telephone line from Copeland to this city, connecting with the local exchange of the Pacific Telephone & Telegraph Company. O.

MILWAUKEE, WIS.—The main exchange of the Wisconsin Telephone Company will be replaced next year at a cost of about $200,000. The Wisconsin Telephone Company will spend $109,362 between now and January 1 in improvements in service.

HOPEWELL, N. J.—The Delaware & Atlantic Telegraph & Telephone Company is making extensions to its lines in the Hopewell Valley district. A new line will be constructed between Hopewell and Woodsville, and include service to Linvale, Snydertown and Rocktown. The company will also build a line from Lambertville to Rocktown. A.

ELKHART, IND.—Charles W. Miller, United States District Attorney, has filed with the Public Service Commission a petition from the Home Telephone Company of Elkhart County, asking authority to issue $30,000 worth of notes. The company desires to place in operation a new switchboard and station at Elkhart and to generally revise its plant here.

ELECTRIC RAILWAYS.

(Special Correspondence.)

LONDON, ONT.—The City Council will submit a by-law on October 16 to raise $700,000 for the electrification of the London and Port Stanley railway.

MILWAUKEE, ORE.—The Portland & Oregon City Railway will build a street car line from Portland to this city. The exact route has not been decided on, although the construction is assured. O.

WOODBRIDGE, N. J.—The New York Telephone Company has requested permission from the Township Committee to install an underground conduit system in certain streets of the township. A.

WAVERLY, IOWA.—It is reported that as soon as the Cedar Falls, Waterloo & Northern Railway Company completes the line to Cedar Rapids, it will begin surveying for an extension into northern territory as far as Mason City. C.

FORT WORTH, TEX.—William Capps, of Fort Worth, and associates are promoting the construction of an interurban electric railway between Fort Worth and Denton. The route of the proposed line is via Keller and Roanoke. D.

SAN FRANCISCO, CAL.—The California Railroad Commission has notified the Peninsular Railway Company (electrical), to install crossing signals at Alta Mesa, El Monte Avenue, Sima, Prospect road, Mountain View road and other points on its road.

BOYD, KY.—Elkhorn & Arnold's Fork Railway Company has been incorporated with a capital stock of $5,000. The incorporators named include John S. Hager, James G. Serey, Charles Russell and H. B. Smith, Ashland. The company will build a road 20 miles in Floyd and Knott Counties.

BIRMINGHAM, ALA. — The Birmingham Rapid Transit Company has been incorporated with a capital stock of $2,000. The incorporators are George B. Kelley, who is president; W. E. Kelley and Carl Steiner. The company proposes to build an electric railway in this city covering some 115 blocks.

FRESNO, CAL.—Two competing parties are now securing rights of way for an electric railway line between Fresno and Clovis, Cal. F. S. Granger, formerly of the Fresno, Hanford & Summit Lake Railway Company, is

representing one group; and J. B. Rogers and Mahoney Brothers, of San Francisco, are representing the other.

LOS ANGELES, CAL.—The Council has just granted the right to the Pacific Electric Railway Company to erect and maintain an elevated line over a section of its system in this city, which will be the first elevated line to be constructed here, and will be the first link in the greater elevated system planned. The complete system, it is estimated, will represent an investment of about $12,000,000. T.

MARION, IND.—The Tipton, Windfall & Marion Traction Company has filed articles of incorporation with a capital stock of $10,000. The object of the company is to operate an interurban line from Tipton to Marion, by way of Windfall. The directors for the new line are William R. Bailey, C. S. Cleaner and James F. Fulton. It is said that the work of surveying for the new line will be started at once, but actual construction work will not be started until the spring.

NEWARK, N. J.—By the passing of ordinances granting six additional franchises to the Public Service Electric Railway Company, the Board of Works has finally approved of the entire terminal project of the company. The plans as now approved include the erection of a terminal in Park Place, a subway under Cedar Street, Broad Street, Military Park and vicinity, and extensions to its present lines in the downtown district. The total cost of the work is estimated at $4,000,000. Richard E. Danforth is general manager. A.

PROPOSALS.

ELECTRIC LIGHT SYSTEM.—Sealed bids will be received until October 16 by Earl D. Jackson, Capitol Bank Building, St. Paul, Minn., for the labor and material required for the construction of an electric light system here.

REBUILDING LIGHTING SYSTEM.—Sealed proposals will be received until October 25 by Eliza Gray, clerk, Lowellville, O., for the furnishing of all material and labor required for the rebuilding and extending of the present lighting system in this village.

ELECTRIC ELEVATORS.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until October 30 for an electric passenger elevator in the post office at St. Louis, Mo.; and until November 1 for an electric passenger elevator in the post office at Miami, Fla. Copies of drawings and specifications may be obtained from the office of the Supervising Architect.

ELECTRICAL SUPPLIES—Sealed bids will be received at the Engineer Depot, U. S. Army, Washington Barracks, D. C., until October 14 for furnishing five pounds No. 18 B. & S. copper wire, 200 screw anchors, 4 gross flat and round head wood screws, 24 key sockets, ⅜ inch pipe, 25 socker bushings, 12 current taps, 12 shades and 3 pendant receptacles. Address Joseph E. Kuhn, Lt. Col., Corps Engineers, U. S. A.

STEAM TURBOGENERATOR.—Sealed proposals will be received until October 13 for the construction and delivery of two direct-connected steam turbogenerators for the Western Hills Pumping Station, Queen City Avenue of the waterworks department of Cincinnati. Plans and specifications and blank proposals can be obtained at the office of the general superintendent of the Water Works Department, City Hall, or at the office of the superintendent of pumping at Main Pumping Station No. 2545, Eastern Avenue. Address V. T. Price, Director of Public Service, Cincinnati, O.

SERIES - INCANDESCENT LIGHTING APPARATUS.—Sealed bids are being called for by the South Park Commissioners, Fifty-seventh Street and Cottage Grove Avenue, for series-incandescent lighting apparatus to be used in connection with the installation of several series-tungsten boulevard-lighting systems, to be delivered to the substations as required. Address J. F. Neil, secretary, South Park Commissioners, Chicago, Ill.

CONDUIT.—Sealed bids will be received on October 15 by the South Park Commissioners, Chicago, Ill., for 17,500 feet of three-inch bituminized-fiber conduit delivered to 3818 Cottage Grove Avenue. Address J. F. Neil, secretary, South Park Commissioners, Chicago, Ill.

FOREIGN TRADE OPPORTUNITIES.

(Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C. In applying for addresses refer to file number.)

NO. 11,744.—AUTOMOBILE ACCESSORIES.—An American consular officer in Canada transmits the name of an established firm in his district which desires to receive from American manufacturers catalogues and price lists of automobile accessories.

NO. 11,748.—ELECTROTECHNIC AND ELECTROCHEMICAL MACHINES AND INSTRUMENTS.—A dealer in electrotechnic, scientific, and similar machines and instruments informs an American consular officer that he desires to correspond with American manufacturers of machines and instruments in this line for the purpose of placing himself in a position to offer such machines to the various departments of a Government institute of technology which is on the point of equipping its laboratories and workshops with the most modern machines and instruments in all lines of science. The inquirer desires illustrated catalogues, price lists, etc.

NO. 11,751.—ELECTRIC OVERHEAD CRANES.—The acting chief railway storekeeper, South African Railways, Johannesburg, has advised the American consulate at Durban, South Africa, that tenders are invited by the High Commissioner of South Africa, 32 Victoria Street, London, S. W., England, for supplying two 50-ton electric overhead cranes for machine shop at Durban, one 3-ton electric overhead crane for brass foundry at Pretoria, one 2-ton electric overhead crane for foundry at Salt River, and one direct electrically-driven hydraulic wheel press for workshops at Bloemfontein. Particulars may be obtained from the High Commissioner at the address given by those interested in the matter.

NEW INCORPORATIONS.

SPOKANE, WASH.—National Undercurrent Power & Irrigation Company has been incorporated with a capital of $100,000. G. A. Wend, and William Rohr are named among the incorporators.

CHICAGO, ILL.—Spitdorp Electrical Company, capitalized at $25,000, has been incorporated to do a manufacturing, construction and jobbing business. Frederick Secord, M. F. Schmidt, James V. Hickey are the incorporators.

CINCINNATI, O.—The Electric Service Company has been incorporated to deal in electrical supplies. The capital stock is $15,000. The incorporators are A. A. Faber, D. J. O'Connor, J. L. Vest, D. E. Wallace and H. A. Haber.

LOUISVILLE, KY.—The Rueff-Griffin Decorating Company has been organized with $5,000 capital stock, by W. J. Rueff, Joseph G. Rueff and Minnie M. Griffin for the purpose of engaging in the electrical decorating business. G.

CHICAGO, ILL.—C. & W. Electric Specialty Company, capitalized at $250,000, has been incorporated to do an electric contracting, constructing and engineering business. George P. Edmonds, A. T. Ewing, Arthur Lund are the incorporators.

CAMBRIDGE, O.—The Cambridge Electrical Company has been incorporated to do a general electrical business. The capital stock is $10,000 and the incorporators are W. H. Pagan, L. H. Slocumb, M. A. Gibbs, K. G. Miller and Frank McCarthy.

NEW PUBLICATIONS.

CANADIAN MINING INDUSTRIES.—The Canadian Department of Mines has published an illustrated report on "Economic Minerals and Mining Industries of Canada." This aims to present in a popular form a brief sketch of the more important economic minerals, both metallic and non-metallic, and of the metallurgical industries of Canada.

SAFETY FIRST.—The United Gas Improvement Company, Philadelphia, Pa., has published a volume entitled "Accident Prevention," which is an amplified revision of a talk presented before the annual convention of the National Electric Light Association, at Chicago, on June 4. The volume is well illustrated and neatly bound. It was prepared by James B. Douglas. It concludes by illustrating first-aid equipment.

AMERICAN PUBLIC UTILITIES.—The American Public Utilities Company, which was formed over a year ago to control properties which were previously operated by Kelsey, Brewer and Company, Grand Rapids, Mich., has issued a booklet describing the various properties which it controls. This is well illustrated with views from the different cities in which these utilities are located.

SMOKE NUISANCE.—The Mellon Institute of Industrial Research and School of Specific Industries has issued Bulletin No. 4, entitled "The Economic Cost of the Smoke Nuisance to Pittsburgh," by John J. O'Connor, Jr. This considers the cost to the smoke maker, to the individual, to the household, to merchants, to quasi-public buildings, and miscellaneous costs, and the total is found to come close to $10,000,000 per year.

FINANCIAL NOTES.

It is announced by the bankers that $3,500,000 of the Middle West Utilities Company, three-year six-per-cent notes and certificates offered to yield seven per cent have been sold and practically all of the remaining $500,000 subscribed for.

Westinghouse Electric & Manufacturing Company paid off $250,000 of its $1,500,000 collateral-trust six-per-cent notes due September 27, and extended the remainder for nine months. The notes it is said are held largely by banks.

At the annual meeting of the Edison Company of Boston to be held October 14 stockholders will be asked to "authorize an application to be made to the Board of Gas and Electric Light Commissioners for authority to issue additional capital stock for the purpose of realizing funds to be applied to the payment of liabilities heretofore or hereafter incurred for additions to and extensions of the plant and property of the corporation."

The Edison Electric Illuminating Company, of Brockton, Mass., has called a special meeting of stockholders for October 24 in Boston for the purpose of authorizing an increase in the capital stock from $948,800 to $1,265,000.

The California Railroad Commission has approved the issue of $7,000,000 six-per-cent gold notes by the Pacific Gas & Electric Company, which completes the plan of financing previously authorized by the commission. Of this issue $4,500,000 has already been sold. They mature on June 25, 1914, which gives them nine more months to run.

At a meeting of the Board of Directors of the Lehigh Valley Transit Company held in Philadelphia, Colonel Harry C. Trextler, of Allentown, was elected chairman of the board of directors, Harrison R. Fehr was elected president of the company vice R. P. Stevens, resigned, and Edward M. Young, of Allentown, was elected vice-president of the company in place of Colonel Trexler, who had formerly held that office.

Niagara, Lockport & Ontario Power Company has sold $900,000 one-year six-per-cent notes secured by the deposit of $1,000,000 par value of Salmon River Power Company first mortgage six-per-cent bonds and $600,000 par value Ontario Power Company capital stock. The notes are being offered to yield 7.5 per cent, and are issued in connection with the construction of the hydroelectric plant of the Salmon River Power Company at Salmon River, 40 miles northwest of Syracuse.

The Idaho Power & Light Company has taken over the holdings of the Beaver Power Company in Boise and southern Idaho, together with all the valuable franchises of the latter company and its several power plants and power lines, the value of which is estimated at close to $1,000,000.

The Pacific Telephone & Telegraph Company has sold $3,000,000 first-mortgage and collateral trust five-per-cent bonds to Lee, Higginson & Company, of Boston, subject to the approval of the issue by the California Railroad Commission. The company proposes to use approximately $1,850,000 of these bonds for the purpose of retiring a like amount of underlying bonds of the Sunset Telephone & Telegraph Company. The balance of the amount of $1,150,000 to be devoted to improvements over the telephone company's system, including additional switchboard, conduit and line facilities in the cities of San Francisco, Los Angeles, San Diego and Oakland. The improvements also provide for new cables and telephone installations. One item provides for connecting 18,000 additional stations throughout the system at an expense of $306,000.

J. P. Morgan & Company announce that a syndicate headed by Lee, Higginson & Company, Harris, Forbes & Company, and Kissel, Kinnicut & Company, has purchased a large block of the new Interborough Rapid Transit Company, first and refunding mortgage 53-year five-per-cent bonds. It is stated that the proceeds of the sale will be used for the purpose of retiring the balance of the $33,000,000 issue of Interborough Rapid Transit Company first-mortgage five-per-cent bonds, called for payment November 1, and for carrying on construction work upon the new subways. The amount of the bonds purchased by the distributing bankers is understood to be $30,000,000. A large block of the issue it is understood has already been underwritten abroad.

Dividends.

Associated Gas & Electric Company; quarterly of 1.5 per cent on preferred, payable October 15.

Edison Company, of Boston; regular quarterly of three per cent, payable November 1 to stock of record October 15.

Illinois Northern Utilities Company; quarterly of $1.50, payable November 1 to stock of record October 18.

Massachusetts Consolidated Railway; 0.5 per cent on common, payable October 15 to stock of record September 30.

Metropolitan West Side Elevated Railway; regluar quarterly of 1.25 per cent on preferred, payable September 30 to stock of record September 29.

Mountain States Telephone & Telegraph Company; a quarterly dividend of 1.75 per cent, payable October 15.

National Carbon Company; regular quarterly of 1.75 per cent on preferred, payable November 15 to stock of record November 5.

Rio de Janeiro Tramway, Light & Power Company; regular quarterly of 1.25 per cent, payable November 1.

Sao Paulo Tramway, Light & Power Company; regular quarterly of 2.5 per cent on the common stock, payable November 1.

South Side Elevated Railroad; regular quarterly of 1.5 per cent, payable September 30 to stock of record September 29.

Youngstown & Ohio River Railroad; a quarterly dividend of 1.25 per cent on the preferred stock, payable September 30

Report of Earnings.

AURORA, ELGIN & CHICAGO RAILROAD COMPANY.

The comparative report of the Aurora, Elgin & Chicago Railroad Company for the month of July is as follows:

	1913	1912
Gross earnings	$208,750.41	$192,753.72
Oper. exp. and taxes.	115,790.58	102,285.56
Net earnings	$ 92,959.83	$ 90,458.16
Interest	33,462.58	32,037.06
Surplus	$ 59,497.25	$ 58,421.08

LEHIGH VALLEY.

	1913	1912
August gross	$3,672,296	$3,999,840
Net after taxes	1,169,182	1,337,511
Two months gross	7,119,997	7,553,547
Net after taxes	2,156,789	2,591,381

MONONGAHELA VALLEY TRACTION.

	1913	1912
August gross	$ 87,561	$ 76,981
Net	56,038	47,254
Surplus after charges	30,481	23,612
Eight months gross	610,624	543,827
Net	398,344	323,140
Surplus after charges	203,599	161,059

PHILADELPHIA COMPANY.

The Philadelphia Company reports earnings for five months ended August 31, 1913, as follows:

	1913	1912
Gross	$9,960,103	$8,693,709
Net	3,662,699	3,218,777
Surplus after charges	1,334,067	820,377

NORTHERN CALIFORNIA POWER.

Northern California Power Company reports earnings for August, 1913, as follows:

	1913	1912
Gross	$82,954	$66,023
Net after taxes	59,858	42,415
Surplus after charges	30,607	11,587

Gross earnings for the month increased 25.2 per cent, net earnings increased 41.1 per cent and surplus after charges increased 164.1 per cent over August, 1912.

AMERICAN POWER & LIGHT.

	1913	1912
August gross	$ 459,635	$ 417,445
Net after taxes	217,291	179,363
Surplus after charges	111,449	102,109
Twelve months' gross	5,624,280	5,211,760
Net after taxes	2,517,492	2,330,303
Surplus after charges	1,452,137	1,477,356
Balance after preferred dividends	797,943	986,805

SOUTHWESTERN POWER & LIGHT.

	1913	1912
August gross	$ 183,878	$ 165,105
Net after taxes	86,412	69,901
Surplus after charges	50,693	47,794
Twelve months' gross	2,126,854	1,812,456
Net after taxes	946,318	809,362
Surplus after charges	616,298	608,893
Balance after preferred dividends	411,917	506,895

FORT WORTH POWER & LIGHT.

	1913	1912
August gross	$ 57,807	$ 43,138
Net after taxes	35,824	19,419
Surplus after charges	28,259	13,617
Twelve months' gross	597,627	474,770
Net after taxes	339,812	223,452
Surplus after charges	263,881	166,800

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Oct. 6	Sept. 29
American Tel. & Tel. (New York)	126⅛	131⅜
Commonwealth Edison (Chicago)	153	153⅛
Edison Electric Illuminating (Poston)	268	269
Electric Storage Battery common (Philadelphia)	47¾	49¼
Electric Storage Battery preferred (Philadelphia)	47¾	49¼
General Electric (New York)	144½	146⅛
Kings County Electric (New York)	119	119
Manhattan Transit (New York)	1¼	1⅜
Massachusetts Electric common (Boston)	15	13¾
Massachusetts Electric preferred stamped (Boston)	67¾	67
National Carbon common (Chicago)	116	116
National Carbon preferred (Chicago)	115	115
New England Telephone (Boston)	148	146½
Philadelphia Electric (Philadelphia)	23	23
Postal Telegraph & Cables common (New York)	80½	79½
Postal Telegraph & Cables preferred (New York)	67	67
Western Union (New York)	63	68½
Westinghouse common (New York)	68⅛	70½
Westinghouse preferred (New York)	110	108

MOBILE ELECTRIC.

Mobile Electric Company, a subsidiary of Standard Gas & Electric Company, reports earnings for the 12 months ended August 31, 1913, as follows:

	1913	1912
Gross earnings	$387,627	$372,673
Net after taxes	180,424	174,964
Surplus after charges	95,624	86,907
Balance after preferred dividends	35,949	27,232

INTERNATIONAL RAILWAY.

The report of the International Railway Company (Buffalo) to the Upstate Public Service Commission for the quarter ended June 30, 1913, compares as follows:

	1913	1912
Gross	$1,534,208	$1,537,343
Net after taxes	538,907	516,161
Other income	20,759	14,262
Total income	559,666	530,423
Surplus after charges	259,212	273,778

WISCONSIN GAS & ELECTRIC.

	1913	1912
August gross	$ 62,108	$ 57,432
Net after taxes	17,635	18,128
Surplus after charges	9,197	9,337
Eight months' gross	480,125	437,578
Net after taxes	122,136	127,452
Surplus after charges	55,812	60,884
Balance after preferred dividends	*12,802	25,551

*Equal to annual rate of 7.17 per cent on the common stock.

KANSAS GAS & ELECTRIC.

	1913	1912
August gross	$ 70,389	$ 57,163
Net after taxes	26,809	17,249
Surplus after charges	12,288	4,116
Twelve months' gross	976,308	1,021,361
Net after taxes	344,974	356,038
Surplus after charges	174,391	209,442
Balance after preferred dividends	69,391	104,442

AMERICAN PUBLIC UTILITIES.

American Public Utilities Company reports consolidated earnings of subsidiary properties for July, 1913, and the 10 months ended July 31, 1913, as follows:

	1913	1912
July gross	$ 148,670	$ 130,078
Net after taxes	60,454	53,173
Other income	12,494	
Net income less expenses	68,509	
Balance after charges and pfd. divs.	1,068	
10 months' gross	1,869,521	1,640,739
Net after taxes	843,682	719,798
Other income	70,913	
Net income less expenses	880,172	
Balance after charges and pfd. divs.	207,441	

HOLYOKE STREET RAILWAY.

The Holyoke Street Railway reports for the fiscal year ended June 30, 1913, compare as follows:

	1913	1912
Gross	$617,713	$587,130
Net	183,614	176,530
Charges	95,552	94,635
Surplus	88,061	81,894
Dividends	85,888	85,888
Surplus	2,173	3,993

BRAZILIAN TRACTION.

The Brazilian Traction, Light & Power Company reports earnings for August, 1913 and the eight months ended August 31, 1913, as follows:

	1913	1912
August gross	$ 2,038,340	$ 1,802,691
Net	1,137,082	958,388
Eight months gross	15,624,438	13,493,369
Net	8,367,429	7,228,645

NEW ENGLAND TELEPHONE & TELEGRAPH.

The New England Telephone & Telegraph Company report to the Massachusetts Public Service Commission for the year ended June 30, compares as follows:

	1913	1912
Gross earnings	$16,120,232	$14,239,387
Total net	4,645,631	4,218,892
Surplus after charges	3,071,292	3,143,974
Dividends	2,947,600	2,742,467
Surplus	123,693	401,507

PERSONAL MENTION.

MR. K. L. AITKEN has resumed his practice of consulting engineering, at Toronto, Canada, having recently returned from an European trip. Mr. Aitken was formerly general manager of the Toronto (Municipal) Hydroelectric System.

MR. FRED M. ROSSELAND, secretary of the Electric Club, of Chicago, who has been connected with the General Electric Company for a number of years, has severed his connection with that company to accept a position in the commercial department of the Chicago Telephone Company.

MR. THOMAS F. ENGLISH, who has been elected president of the Indiana Electric Light Association, is vice-president and general manager of the Muncie Electric Light Company, of Muncie, Ind., which position he has held since January, 1910. For the five years preceding that date he was associated with the Union Light, Heat & Power Company, of Covington, Ky., now part of the system of the Cincinnati, Newport

Thomas F. English.

& Covington Light & Traction Company. For two years prior to that period he was connected with the New York Edison Company. Thus he has been in central-station work for over 10 years, before which he was for some time electrical engineer in New York State service. Until about six years ago his work was chiefly along electrical and mechanical engineering lines, but the last half-dozen years have seen most of his time taken up in the executive department of the central-station industry. Mr. English has served on many committees of the National Electric Light Association and the Indiana Electric Light Association, being chairman of the latter's Executive Committee during the past year.

MR. R. G. BLACK, the well known consulting engineer, has been appointed a member of the Toronto Hydroelectric Commission to fill the vacancy caused by the resignation of H. L. Drayton. Mr. Black is a graduate of the University of Toronto. He is well known in the United States, and has served as a manager of the American Institute of Electrical Engineers.

PROF. FRANK G. WOLLSON, for the past three years assistant professor of electrical engineering at the University of Illinois, has taken charge of the electrical department of the Wentworth Institute, a trade school, in Boston. Professor Wollson is a native of Montana and was educated at the Montana State College, University of Wisconsin, and the University of Illinois.

MR. W. W. FREEMAN has resigned as vice-president of the Alabama Power Company, to accept the post of vice-president and general manager of the Union Gas & Electric Company, Cincinnati, O., a subsidiary of the Columbia Gas & Electric Company. Prior to his connection with the Alabama Power Company, Mr. Freeman was vice-president of the Edison Electric Illuminating Company, of Brooklyn, N. Y.

OBITUARY.

MR. P. H. HARBOLDT, superintendent of the Electric Meter Department of the Louisville Gas & Electric Company, died at Louisville, Ky., on September 28. Mr. Harboldt had been in the employ of the company many years and his loss is felt deeply by the company as well as his many friends.

DR. HERMANN ARON died on August 29 at Hamburg, Germany, in the sixty-eighth year of his age. Dr. Aron was best known through his invention of an electrical meter of the pendulum type. He was also the first to introduce the two-wattmeter method of measuring power in a three-phase circuit. Dr. Aron was born on October 1, 1845, in Kempton. At the age of 30 he became an instructor in the Berlin Gewerbe-Akademie, which later became the well known technical school at Charlottenburg. He later became an instructor in the University at Berlin, and in 1880 was made professor at the technical school. He is the author of a number of important articles on physical and electrical subjects. His many inventions were applied through several manufacturing companies in which he was interested.

MR. ROBERT MAXWELL MORRIS, 36 years old, general manager of sales of the Safety Armorite Company, Pittsburgh, Pa., died at his home at Pittsburgh, on September 26, following a short illness. He was born in Pittsburgh and had spent the greater part of his life there. Mr. Morris was first employed by the Western Electric Company in its Philadalphia house. Later he was made manager of the Pittsburgh establishment. He resigned from the Western Electric Company, to go with the Garland Corporation to assume the position he held at the time of his death. Mr. Morris was a son of Captain H. Morris, for 40 years a master of steamboats on local Pennsylvania and Ohio Rivers, and Rebecca Shiras Morris, cousin of Justice George Shiras, of the Supreme Court of the United States. Both his father and mother were in Europe at the time of his death. In 1904 Mr. Morris married Jane G. Patterson, daughter of James W. Patterson, then general manager of the Wabash-Pittsburgh Terminal Railroad. Mr. Morris was a member of several local organizations, among them the Jovian League. He leaves his widow and four children, his parents, two brothers and one sister.

MR. ROBERT EDWARDS, who established Edwards & Company, died at his residence in Loweree, Yonkers, N. Y., on September 27, 1913. He was born on September 19, 1838, in London, England, coming to this country in 1847. He first resided in Fond du Lac, Wis., but about 1849 returned to New York City, with his family, where he resided continuously. He was edu-

cated at Manhattan College, in New York City. After completing his education he entered the jewelry business, and was for many years with the firm of Bishop & Rein, in the old Fifth Avenue Hotel. In the early 70's he entered the electrical business and in 1872 started Edwards & Company as a contracting concern. The business has been carried on continuously from that time. In the early days of his electrical career this company merely manufactured material for their own use, but about ten years ago the manufacturing interest became prominent, the construction end of the business was disposed of, and his entire attention was devoted to manufacturing. Mr. Edwards continued as the head of the company until about five years ago, when he retired from acitve management, but always retained an interest in the company and was its president at the time of his death. Mr. Edwards was one of the early settlers of what is now known as Bronx Borough, having taken up his residence there in 1869, where he lived until two years ago, when he removed to Loweree, a suburb of Yonkers. He was one of the oldest Masons in New York City, having joined Gavel Lodge No. 703, F. & A. M., in 1870. He always took an active interest in Masonic affairs and was twice master of his lodge. In recognition of his services, he received the exceptional distinction of being made an honorary member. He was also a very active worker in Methodist Church circles and was a member of one church for 44 years. He is survived by his wife, four children and nine grandchildren.

DATES AHEAD.

American Electric Railway Association. Annual convention, Atlantic City, N. J., October 13-17.

Jovian Order. Annual convention, New York, N. Y., October 14-16.

Railway Signal Association. Annual convention, Nashville, Tenn., October 14-17.

Telephone Pioneers of America. Annual meeting, Chicago, Ill., October 16-17.

Electrical Exposition and Motor Show of 1913. New Grand Central Palace, New York, N. Y., October 15-25.

American Mining Congress. First national mining show, Horticultural Hall, Philadelphia, Pa., October 17-25.

Association of Railway Electrical Engineers. Annual convention, Hotel La Salle, Chicago, Ill., October 20-24.

Electric Vehicle Association of America. Annual convention, Hotel La Salle, Chicago, Ill., October 27-28.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Columbus, O., November 20-22.

With the Electrical Manufacturers

Frank Adam Electric Company, St. Louis, Mo., has issued bulletin No. 19. This is a 32-page publication illustrating and describing the many types of knife switches made by the company. Each type of switch is illustrated with more or less detail and full data relating thereto are given in each case.

Philadelphia Storage Battery Co., Philadelphia, Pa., announces the removal of its depot and offices in Chicago to the Moon Building, 2612 South Michigan Boulevard. The business of the company's Chicago branch has grown to such a volume that it was necessary to have increased facilities.

Van Expansion Bolt Company, Fort Dearborn Building, Chicago, Ill., has issued a pamphlet dealing with its various specialties, including the well-known Van expansion unit, the drill hammer, concrete wall-form ties, etc. An interesting summary of tests on the Van expansion units is also included.

Otis Elevator Company, New York City, published a well illustrated souvenir dealing with automatic electrically driven hoisting machinery for use in connection with blast furnaces, which was given to the members of the Association of Iron and Steel Electrical Engineers at the recent convention in New York City.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued Bulletin 1084 dealing with steam turbines and turbogenerators. This is a 52-page bulletin describing in great detail and illustrating many parts of these machines as well as complete units in various typical installations. The characteristics of the machines and their advantages are clearly pointed out.

Pawling & Harnischfeger Company, Milwaukee, Wis., has issued Bulletin 301 dealing with type U electrically driven hoists. This type is intended for normal speed and ordinary operation in factories, shops, warehouses, etc. Either direct-current or alternating-current motors are used. Drum-type controllers are supplied. Various parts of the equipment are described and illustrated in the bulletin. Dimension diagrams and data are also included.

The Cutter Company, Philadelphia, Pa., is sending out its annual wall calendar, covering the period from October of this year to September, 1914. As usual each leaf bears a large illustration of one of the company's various types of I-T-E circuit-breakers, together with some descriptive matter explaining the use and particular advantages of each of these types. Among the more unusual forms of breakers illustrated and described is one showing a 25,000-ampere double-pole motor-operated circuit-breaker for the control of two large direct-current generators.

The Calculagraph Company, 1469 Jewelers Building, New York, N. Y., is distributing some interesting literature describing the use of the Calculagraph for eliminating mistakes. In the bookkeeping of an industrial plant of any character the Calculagraph performs a function not secured with any other device. One use of the Calculagraph is to subtract the time of day a workman begins from the time of day he stops and the machine actually prints the difference,—the elapsed time—the actual working time. Copies of this literature will be sent to those interested upon request.

The Blackburn Specialty Company, Cleveland, O., has constructed a new factory building at the corner of Perkins and Thirty-fifth Streets, Cleveland. This factory is of fireproof, daylight construction, and the company will have the most modern facilities for the production of its various specialties. The business has been growing very rapidly in electrical lines and the company has recently added several specialties which have made it necessary to have additional space. While the company will not occupy the entire new building at present, it is expected that in the near future it will require all of the space available.

Hart & Hegeman Company, 342 Capitol Avenue, Hartford, Conn., has issued Catalog K. This has over 60 pages beautifully illustrated with a great variety of types of rotary snap surface and flush wall switches, push-button surface and flush wall switches, wall receptacles, pendent switches, wall-switch cases, etc. Diagrams of wiring connections for various types of switches are given on two pages. An interesting feature of this catalog is that a combined index and price list is conveniently placed on the last 12 pages of the book, thus bringing together in compact form a complete list of the many types of switches and switch parts.

George Cutter Company, South Bend, Ind., has issued Bulletin 3168 dealing with Cutter Idealite fixtures. This interesting bulletin contains very many effective illustrations and much valuable data aiming to correct evils in lighting installations. The Idealite reflectors which are designed for commercial and industrial service are described. These possess the unique feature of an adjustable socket which permits changing the size of lamp and also the position of the socket to secure almost any desired light distribution. The socket is spring-supported, making it peculiarly serviceable for use with tungsten lamps in places subject to heavy vibration. Various types of fixtures with or without Idealite re-

flectors are shown. Among these are many fixtures suitable for factory lighting and others for outdoor lighting.

Siemens & Halske and **Siemens-Schuckertwerke,** Berlin, Germany, have begun the regular monthly publication of a bulletin entitled *Mitteilungen.* The first number was issued in July and among the interesting contents of this 16-page publication was an illustrated article describing the local and long-distance semi-automatic telephone exchange in Posen, Germany; another article dealt with high-tension transmission lines and switches for polyphase systems; another article described the development of the modern incandescent lamp. The August number contained among many other articles an illustrated description of electrically operated switches for street railways; another article reviewed the electrical export industry of the three largest electrical manufacturing countries, the United States, Great Britain and Germany.

The Electric Controller & Manufacturing Company, Cleveland, O., has issued Bulletin 1017 dealing with automatic controllers for direct-current motor-driven machines. These control sets are especially adaptable for operation by electrically unskilled operators, since they provide for acceleration, stopping and reversal of the motor under the best conditions. The bulletin describes the various parts of the equipment, particularly the accelerating units and the operators' switches. Dimension diagrams and complete data of the various types of equipment are also included. The company has also issued Bulletin 1036, which describes the Youngstown safety limit stop for direct-current hoisting and crane motors and for similar machines which must not be operated beyond a definite limit. These limit stops are all compact and of reliable construction and are entirely automatic.

Maschinenfabrik Oerlikon, Oerlikon, near Zurich, Switzerland, has issued a number of new publications, of which Bulletin 70 deals with a prolonged test of a 628-kilowatt series-parallel turbo-generator group. Results of this test showed exceptionally high efficiency. Bulletin 71 describes a unique sand-sifting machine driven by a vertical motor and particularly adapted for use in large foundries. Bulletin 572 deals with motor-generator sets. Ten different sets are described and illustrated; most of these comprise a direct-current machine and a polyphase machine; two-unit sets are described. Bulletin 574 describes direct-current generators for electrochemical purposes. These machines are built either of the horizontal or vertical type and designed for current capacities up to 10,000 amperes. They are arranged for operation by steam or hydraulic turbines, engines or electric motors. Being low-voltage machines, they carry very heavy currents. Special attention has been given to the liberal provision of commutating surface and brush gear.

General Electric Company, Schenectady, N. Y., has issued Bulletin A4115, which is entitled "Electricity on the Farm," and constitutes the most exhaustive treatise on this subject which has yet been issued by any manufacturer. The various chapters cover lighting systems for the farm, the uses of electricity in the farm home, and a dissertation on the general advantages of electric motor drive. The actual applications of motors for the operation of dairy apparatus, barn and field machinery and miscellaneous power service, are profusely illustrated and accompanied by practical suggestions, together with indications of the cost of the electrical equipment as compared with other forms of power application. This section of the bulletin also covers the use of electric vehicles on the farm. The question of irrigation has been gone into in detail, and elaborate tables are included showing the conditions encountered in the various farm sections of the United States, describing the equipment and methods of applying water in both the arid and humid regions. This 72-page bulletin contains a wealth of statistical information of a very practical nature which has not hitherto been available to the farmer, the central-station manager, or the sales agent, and should prove of unusual interest to all those engaged in the extension of electrical service on the farm. The company has also issued Bulletin 4972, describing the KR system of voltage regulation, which can be successfully employed on systems having such large fluctuations of voltage that the standard method is ineffective. The system comprises a booster, combined with an automatic regulartor.

Record of Electrical Patents.

Issued by the United States Patent Office, September 30, 1913.

1,074,106. Process of Producing Ozone and Separating Gases. H. Dumars, Glen Ridge, N. J. Air is cooled to a low temperature and then subjected to electric discharges to produce liquid ozone.

1,074,120. Compression-Table and System of Operation for the Same. S. T. Hutton, assignor to Scheidel Western X-Ray Coil Co., Chicago, Ill. Includes means for accurately supporting the X-ray tube and auxiliaries.

1,074,125. Method of Operating Induction Motors. B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. Sections of the polyphase stator winding are first connected in series and then into two independent star groups.

1,074,137. Pressure-Alarm Gauge. F. Schubert, Sellersville, Pa. Electric alarm associated with Bourdon-tube gauge.

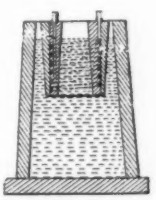
1,074,146. Therapeutic Electrode. R. H. Wappler, assignor to Wappler Electric Mfg. Co., New York, N. Y. Includes a reciprocable rod and sponge with a casing.

1,074,152. Alternating-Current Motor. H. L. Zabriskie, assignor to Diehl Mfg. Co., Elizabeth, N. J. A commutator motor is adapted for use on direct current by having an inductive shunt across the armature terminals and a high-resistance winding forming part of each series-field coil.

1,074,170. Telegraphic System. J. Gell, London, England. An exchange with switchboard and relays for connecting a large battery to the trunk line and a small battery to the local subscribers' lines.

1,074,171. Receiver for Automatic Telegraphic Systems. J. Gell. Includes an electromagnetically controlled marking wheel.

1,074,179. Vapor Electric Apparatus. A. M. Jackson, assignor to General Electric Co. Includes electromagnetic means for producing partial rotation of the tube.



1,074,251.—Electric Heater for Use in Manufacturing Ingots.

1,074,215. Electrothermostatic Regulator. J. G. Schuirmann, Kent, Wash., assignor of one-half to C. L. Santee. Includes a resistance coil and a thermostatic bar.

1,074,216. Electrically Heated Pad and the Like. J. G. Schuirmann, assignor of one-half to Charles L. Santee. Flexible joints connect the sections of the heating eelment.

1,074,218. Fuse Device. A. E. Simmons, Sacramento, Cal. A vertical cartridge fuse with gravity-operated rod to help in sudden rupture of the fuse.

1,074,231. Electrolytic Condenser. C. I. Zimmerman; J. G. Zimmerman, administrator of said C. I. Zimmerman, deceased, assignor to General Electric Co. Contains aluminum electrodes and an aqueous solution of an oxyacid of boron, a borate and glycerine.

1,074,241. Combination Electric Switch. Y. Burgess, Chicago, Ill. A number of rotary switch elements, connectable in series, are mounted in a single casing.

1,074,251. Apparatus for Manufacfacturing Ingots. W. H. Connell, Pittsburgh, Pa. An electric heater inclosed in a refractory shell is introduced into the top of the ingot to retard its cooling. (See cut.)

1,074,253. Vapor Electric Apparatus. J. T. H. Dempster, assignor to General Electric Co. Automatic means for tilting a mercury-vapor lamp.

1,074,262. Electric Oscillograph. J. T. Irwin, London, England. Includes two electrostatic couples and a means to indicate the induction produced in them.

1,074,274. Apparatus for Extracting Metals From Ores. H. S. MacKay, assignor to MacKay Copper Process Co., Riverside, Cal. Includes an electrolyzing vat with diaphragms to divide it into a number of anode and cathode compartments.

1,074,286. Microtelephone. W. B. Oliver, assignor to Oliver Electric Co., Philadelphia, Pa. Has a relatively

massive carbon-block electrode provided with pockets containing carbon granules.

1,074,298. Telephone Repeater System. H. E. Shreeve, assignor to Western Electric Co. Includes special switching links and relays.

1,074,303. Electrical Illumination. E. Weintraub, assignor to General Electric Co. A high-voltage mercury arc is maintained in a quartz tube of small bore so as to keep the tube incandescent.

1,074,333. Glower for Electrical Incandescent Lamps. O. M. Thowless, Newark, N. J. A fritted filament composed of tungsten and oxide of aluminum covered with a coating of tungsten.

1,074,338. Dynamo-Electric Machine. C. E. F. Ahlm, Cleveland, O. Has two pairs of adjoining main poles with commutating poles between the two pairs.

1,074,354. Flashlight. A. J. Dupont, Adams, Mass., assignor of one-half to A. H. Monat. A casing attachable to the back of the hand contains a battery, a lamp at the end and a lamp at the side.

1,074,371. Automobile Horn. R. H. Manson, assignor to Dean Electric Co., Elyria, O. An electromagnet actuates an armature on the anvil attached to a sonorous diaphragm. (See cut.)

1,074,376 and 1,074,377. Electric Pocket-Lamp. E. Neudörffer, Stuttgart, Germany. The first patent relates to a watch-size casing containing a battery, lamp and special rotary switch. In the second patent there are two batteries and a lamp in the spacing block between them.

1,074,383. Electric Metal-Working Apparatus. A. F. Rietzel, assignor to Thomson Electric Welding Co., Lynn, Mass. A step-by-step seam-welding machine.

1,074,385. Motor-Stopping Device. A. F. W. Schlueter, Bartlett, Ill. Rising of a tank float to a certain point closes the engine throttle valve and opens the ignition circuit.

1,074,392. Electric-Motor Regulation and Control. L. H. Thullen and F. W. Willey, assignors to Triumph Electric Co., Cincinnati, O. An interpole motor has its interpoles provided with a main and an auxiliary winding, the latter being in service only while the load changes suddenly, so as to produce a heavy reinforcement at that time.

1,074,396. Riveter. F. J. West and H. W. Darby, Winnipeg, Man., Can. Electromagnetically operated portable riveter.

1,074,401. Fan. C. Wysocki, Whiting, Ind. A special fan body is mounted on the vertical shaft of the motor.

1,074,408. Apparatus for Fusing Electrolytes. H. R. Carveth, assignor to Roessler & Hasslacher Chemical Co., New York, N. Y. Comprises a melting pot and groups of horizontal and vertical adjustable electrodes dipping into the fused mass.

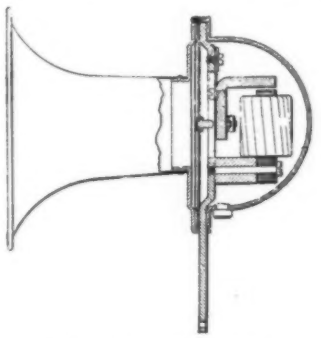
1,074,414. Display Board. H. Detrick, Houston, Tex. A baseball scoreboard with electric lamps as indicators.

1,074,416. Magneto Ignition System. J. M. Dinkins and F. B. Hays, assignors of eight-fifteenths to William L. Taylor, Indianapolis, Ind. A generator with primary and secondary windings on the armature.

1,074,423. Method of Wireless Signaling. R. A. Fessenden, assignor to S. M. Kintner, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Consists in passing the received currents to a primary to induce currents in the secondary and in compensating the secondary currents.

1,074,424. Magnetic Material. R. A. Fessenden, assignor to S. M. Kintner and H. M. Barrett. A telegraphone wire with nonmagnetic metal base and a series of magnetic bars fixed crosswise thereon.

1,074,428. Means for Operating Cocks, Valves, and the Like from a Distance. J. M. F. H. Gil, Paris,



1,074,371.—Electric Horn.

France. Operated by a reversible electric motor with special hand starter.

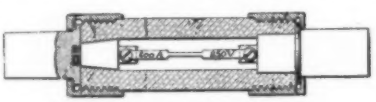
1,074,431. Circuit-Controlling Contact. E. M. Hewlett, assignor to General Electric Co. Relates to the auxiliary carbon contacts on the circuit-breaker.

1,074,434. Fuse. J. W. Hooley, New York, N. Y. An inclosed fuse with a shell of glass. (See cut.)

1,074,436. Alarm Clock. G. J. Jaccard, New York, N. Y. Includes an electric alarm and lamp.

1,074,449. Lamp. D. D. Myers, La Fayette, Ind., assignor to Esterline Co., Indianapolis, Ind. Electric vehicle-headlight.

1,074,454. Lightning Arrester. F. W. Peek, Jr., assignor to General



1,074,434.—Glass-Inclosed Fuse.

Electric Co. An electrolytic cell arrester with a closed circuit of low impedance inductively interlinked with the cells to increase the self induction of the discharge circuit.

1,074,456. Space Signaling System. H. F. Perkins, assignor to General Electric Co. Includes a mercury arc and means for starting the arc and maintaining it conductive during desired intervals in accordance with the signals being conveyed.

1,074,459. Electrical Connector. H. W. Pogue, Decatur, Ill. A plug and socket arrangement for a flatiron.

1,074,462. Ozonizer. F. H. Richards, assignor to J. P. Morris, New York, N. Y. Relates to the arrangement of the tubes.

1,074,496. Electric Coin-Controlled Device. F. E. Dodge and N. M. Loomis, Hartford, Conn. Electromagnetically controlled.

1,074,512. Controller Regulator. R. Marx, assignor to Defiance Mfg. Co., Philadelphia, Pa. A pawl-regulated controller handle.

1,074,537. Signaling Device. L. Abeles, Philadelphia, Pa. Automobile device with several electric lamps in as many compartments.

1,074,542. Magneto-Electric Ignition Apparatus for Use with Internal-Combustion Engines. C. Ebner, Stuttgart, Germany. Relates to construction details.

1,074,544. Thermostatic Circuit-Closer. C. V. Fite, Charlotte, N. C. Includes an expansible bar.

1,074,549. Electrolytic Apparatus. H. Henkel and W. Weber, assignors to Henkel & Cie., Dusseldorf, Germany. The cathode is wound about a porcelain tube separated by a diaphragm from an encircling anode tube.

1,074,562. Belt-Tightener. L. A. Tirrill, assignor to General Electric Co. For mounting on the end plate of an electric motor.

1,074,576. Mica-Building Machine. J. R. Sanborn, assignor to Westinghouse Electric & Mfg. Co. Includes means for ejecting flake mica from a hopper into a tower and sifting a powdered binding material thereupon.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired October 6, 1913.

568,740. Electric Slide for Chandeliers. G. J. Carson, Chicago, Ill.

568,756. Insulated Electric Cable. M. Guilleaume, Mulheim-on-the-Rhine, Germany.

568,779. Electric Locomotive. J. E. Lockwood, Detroit, Mich.

568,780. Composition of Matter for Use in Manufacturing Glow Bodies for Incandescent Lamps. G. Lowenberg, Berlin, Germany.

568,783. Switch for Electric Heating Devices. J. E. Meek, New York, N. Y.

568,798. Electric Arc Lamp. R. Schefrauer, Hoboken, N. J.

568,838. Night Signaling. R. O. Crowley, Elizabeth, N. J.

568,861. Electric Arc Lamp. N. G. Meade, Jamestown, N. Y.

568,863. Means for Generating Electric Waves or Oscillations. D. McF. Moore, Newark, N. J.

568,891. Electric Motor Truck. N. C. Bassett, Lynn, Mass.

568,919. Socket for Incandescent Electric Lamps. J. Pass and A. P. Seymour, Syracuse, N. Y.

568,933. Electric Mining-Machine. R. H. Wiles, Freeport, Ill.

568,947. Oscillating Reciprocating Tripolar Electric Motor. T. H. Hicks. Detroit, Mich.

568,964. Electric Cable. S. P. Thompson, London, England.

568,971. Multifuse Cutout. W. Ehrhardt, Union, N. J.

568,993. Lock-and-Block Signaling on Railways. W. R. Sykes, Jr., and J. P. O'Donnell, London, England.

569,018. Telephone. A. Gartner, Newark, N. J.

569,099. Electric Clock - Striking Mechanism. F. E. Girod, Geneva, Switzerland.

569,101. Automatic Electromagnetic Brake for Railway Cars. E. A. Hauerwas, Saratoga Springs, N. Y.

569,122. Electrical Gas-Reaction Apparatus. A. A. Naville, P. A. Guye and C. E. Guye, Geneva, Switzerland.